SIRIUS®

DEWESoft®

TECHNICAL REFERENCE MANUAL

SIRIUS® V23-1

1. Table of contents

2. About this document

This is the Technical Reference Manual for SIRIUS® Systems.

SIRIUS is a versatile data acquisition hardware line which comes in many different form factors and can be equipped with a wide range of different amplifiers, so that you can use it for virtually any measurement task. Each system also includes a professional license for our award-winning Dewesoft data acquisition software.
The manual is divided into several chapters. You will find:
- A detailed description of the SIRIUS hardware and the main combination and expansion options
- A description of the connection variants and the pin assignments on the inputs and outputs
- A comprehensive introduction to the configuration of the modules using DewesoftX®
- Detailed technical data: Specifications, etc.

2.1. Legend

The following symbols and formats will be used throughout the document.

Important
Gives you important information about a subject.
Please read carefully!

Hint
Gives you a Hint or provides additional information about a subject.

Example
Gives you an example of a specific subject.

Safety symbols in the manual:

Warning
Calls attention to a procedure, practice, or condition that could cause the body injury or death

Caution
Calls attention to a procedure, practice, or condition that could possibly cause damage to equipment or permanent loss of data.

2.2. Online versions

2.2.1. SIRIUS® Technical Reference Manual

The most recent version of this manual can be downloaded from our homepage:
https://download.dewesoft.com/list/manuals-brochures/hardware-manuals
In the Hardware Manuals section click the download link for the SIRIUS® technical reference manual.

2.2.2. DewesoftX® User Manual

The DewesoftX® User Manual document provides basics and additional information and examples for working with DewesoftX® and certain parts of the program.
The latest version of the DewesoftX® tutorials can be found here:
https://download.dewesoft.com/list/manuals-brochures/software-manuals
In the Software Manuals section click the download link of the DewesoftX® User Manual entry.

Important
Read safety instructions first in chapter Safety instructions

3. Getting started

This chapter will help you to install the software, connect your SIRIUS® system to the PC via USB and will show you how to configure DewesoftX®.

To follow these steps, you need the following items:
- your brand new SIRIUS system (included in the shipment)
- your SIRIUS USB stick (included in the shipment)
- your PC with Windows 10
- Note: older versions like Windows® 7 may also work

3.1. Software installation

For optimal working, we recommend that you install the latest version of DewesoftX. If you already have DewesoftX installed, please check if a newer version is already available. You can either check on the website under Support/Downloads/DewesoftX section or directly in software under the Options/Check for updates. In both cases the changelog is included
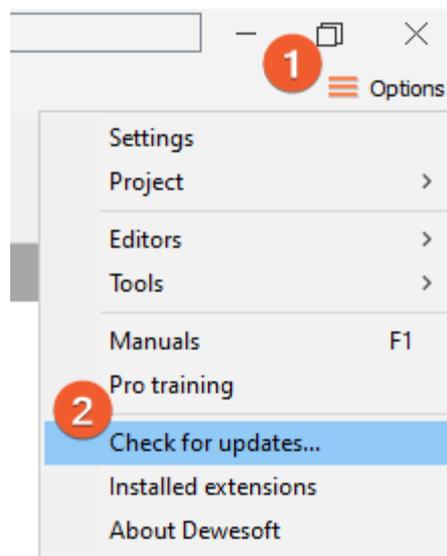
Check for updates

3.2. Connecting a single slice

3.2.1. USB slice

First connect the power supply to the connector named POWER IN of your SIRIUS system.

SIRIUS USB: connectors on the rear side

USB cable

Then connect the USB cable to the rear-side of the SIRIUS system (see connector named USB in Illustration "*SIRIUS USB: connectors on the rear side*"). Finally, connect the other side of the USB cable to the USB port of your computer.

3.2.2. EtherCAT slice

For the EtherCAT slice a RJ-45 to 8-pin LEMO connector is needed to connect the device to the PC.

Connection of single SIRIUS EtherCAT device

3.2.3. Dewesoft settings SIRIUS

The connected device will show up in the Dewesoft settings. Click on the Options button at the top right, and then on the Settings item in the pop-up to open the Dewesoft settings dialogue.
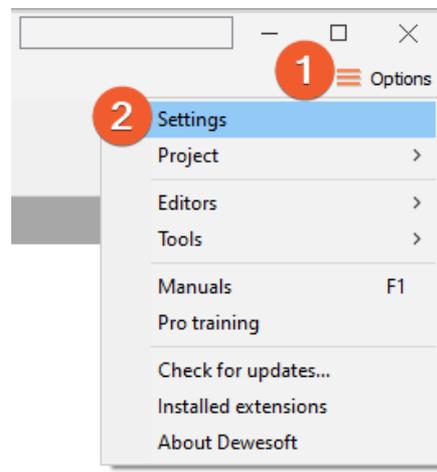
Dewesoft settings

In the Devices section, you can see the connected SIRIUS device. When you select one of them, the properties pane at the right will show the related data e.g. Serial number, Firmware version, etc.
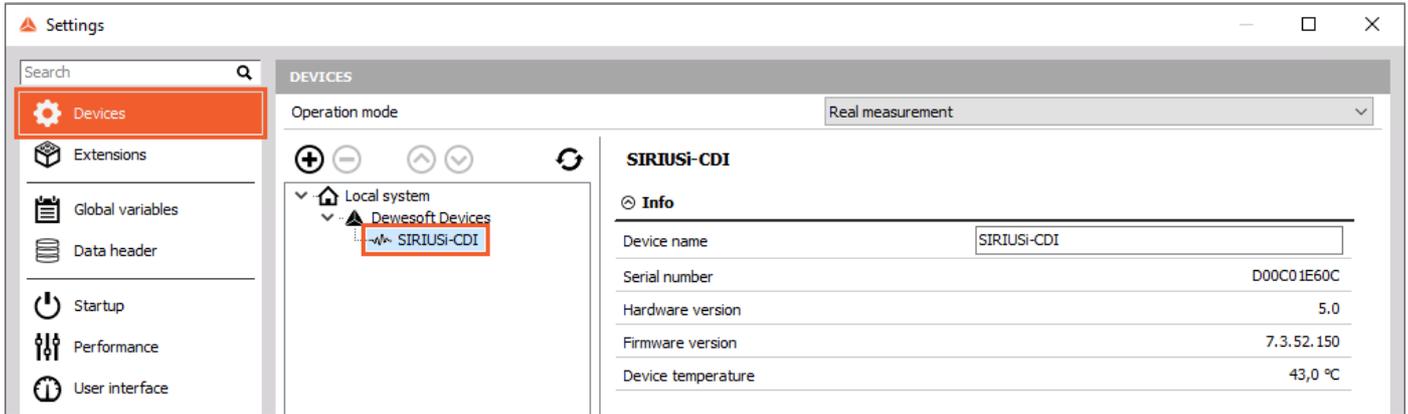
Dewesoft settings: Device

3.2.4. Channel setup SIRIUS

When Dewesoft has started up, you will be in the Measure mode and see the Setup files list or you can create a New setup ❶. Click on Ch. setup (on the right of Setup files) to switch to the Channel setup mode ❷. In the channel setup you can see a preview of the connected devices on the upper left side.

Setup files

Channel setup SIRIUS

Hint

When you click on a connector in the image the corresponding channel in the Channel setup grid will automatically be selected. This also works the other way around: when you select a channel (or multiple channels) in the setup grid, the corresponding connectors in the image will be highlighted.

The sampling rate will be set for all connected SIRIUS devices: of course only up to the max. sampling rate of the individual slices.

3.3. Simple measurement

This chapter describes measurement basics, how to configure SIRIUS and gives some details on the measurement setup.

3.3.1. Help - manual

Note that this document is just a quick start guide. For detailed information about Dewesoft consult the Manual. To open the manual press the F1 button or click on the Options button ❶ and then select Manual from the pop-up menu ❷.
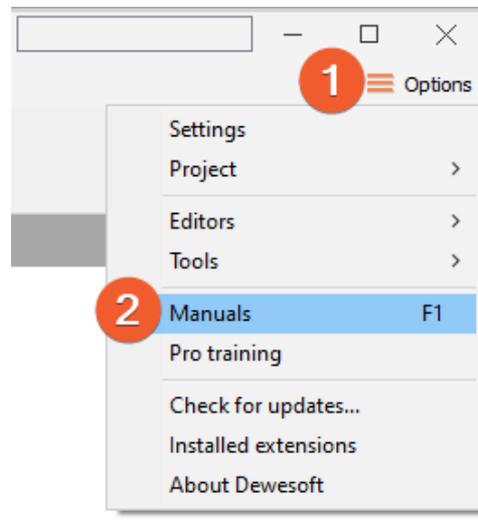
Help - Manual

3.3.2. Analog channel setup

In the analog channel setup screen you can see all channels of your connected SIRIUS systems. Per default only the first channel will be set to Used. Unused channels will not show up in measure mode and can thus not be used for display, calculations or storing: thus, we will also set the other channels to the used. You can left-click on the Used column of channel 2 ❶, hold the mouse button and move the mouse down to channel 8 ❷: then release the mouse button and all channels will be selected – this is shown by the black rectangle around the buttons. Then you can click into the selected region to toggle Used/Unused for all channels at once. The selected channels will also be highlighted in the small preview image of the device ❸.

When you press the Setup button of a channel (the column at the right edge of the channel table – not shown in this screen-shot), you can change all the settings of the channel amplifier. You can also change the sample rate of SIRIUS ❹.

Channel setup screen

3.3.3. Sample rate

One of the most important settings is the sample rate. The sample rate defines how many data points SIRIUS will transfer to the Dewesoft. Higher sample rate also means that more data needs to be transferred via USB to your computer.

The sampling speed mainly depends on your application. To display your signal in a time domain with a good time resolution, you should sample 10 to 20 times faster than the frequency of the signal that you want to measure, e.g. 1 kS/s for a 50 Hz sine-wave. If you have a lot of high frequency components, it may be necessary to sample 100 times faster, e.g. 5 kS/s for the 50 Hz sine-wave, or even more. If you display only the frequency domain (FFT analysis), a 2.5 times faster sampling would be sufficient (125 S/s for the 50 Hz sine-wave). The higher the sampling rate, the better the time resolution. But also the file size will increase.

Sample rate

3.3.4. Measurement mode

A click on Measure (at the right side of Ch. setup in Illustration below) will take you to the Recorder screen measure mode where you can already see live data.

💡 **Hint**

When switching to Measure mode the data will not be stored automatically.
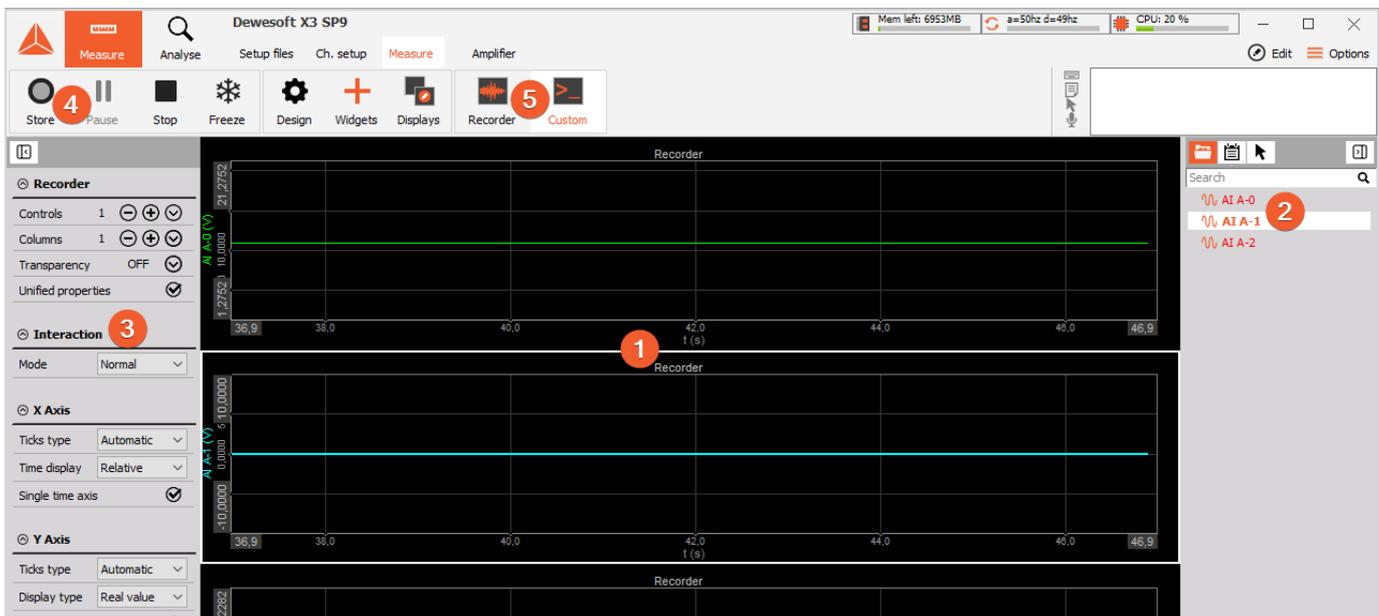
Measure mode

In measure mode you can have several measurement screens ❺. Dewesoft will create 2 default displays: Recorder and Custom but you can also create new displays or change the widgets on existing displays as you like.

The most important sections of the Measure mode are highlighted in screen-shot Illustration "Measure mode":

❶ shows the live measurement data in different widgets which are depending on the selected measurement screen. In this case we see a simple recorder widget where data is presented in time domain. You can use the channel-selector list ❷ to assign measurement channels to the widgets. Each widget has different settings, ❸ shows the settings of the currently selected recorder widget.

To start storing the data, press the Store button ❹. When you are done with recording, press the Stop button.

Now Dewesoft has created a data file with all the data that you have seen during the recording session. You can now click the Analyse button (on the left-top of the screen to the right of the Measure button) to go to Analyse mode.

3.3.5. Analyse mode

When you have just stopped a measurement, Dewesoft will automatically open the last recorded data file in Review mode, so that you can start the analysis right away.

Analyse mode

The Review mode is much like the measurement mode. You will see the same measurement displays, the channel-selector list and the properties of the currently selected widget.
Differences are:

❶ you have additional tool-buttons

❷ there is a Signal overview window which will show you the whole data of one selected channel of the data file

❸ there are additional cursors (Yellow and two white cursors)

Now you can use the cursors to analyse your data, zoom in and out of the data, click Offline math to add computations based on your data, etc. You can also change the design of your measurement displays, print reports based on your data and export the data to other file formats for further analysis.

3.4. Advanced configuration

Note, that the Dewesoft launcher has already done the hardware setup for you – you can check this in the Settings dialogue. Click the Option button ❶ – and then click the Settings menu item ❷.
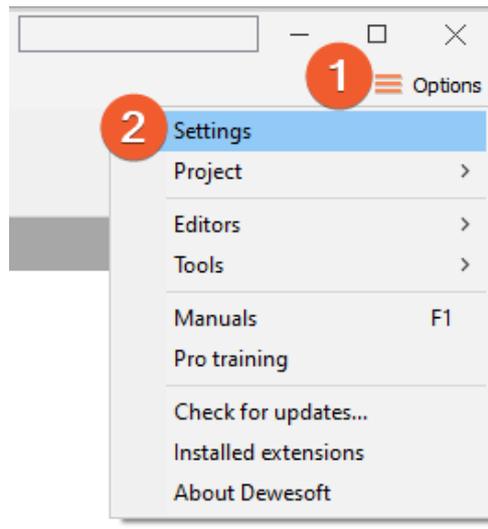
Open settings dialogue

The settings window will appear where all the currently connected devices will be seen.

If you add a device while this screen is open (or if your device is not shown yet), you can press the Refresh button ❸ to scan for devices. When you select a device from the list you will see all the device details and settings in the right area ❹.
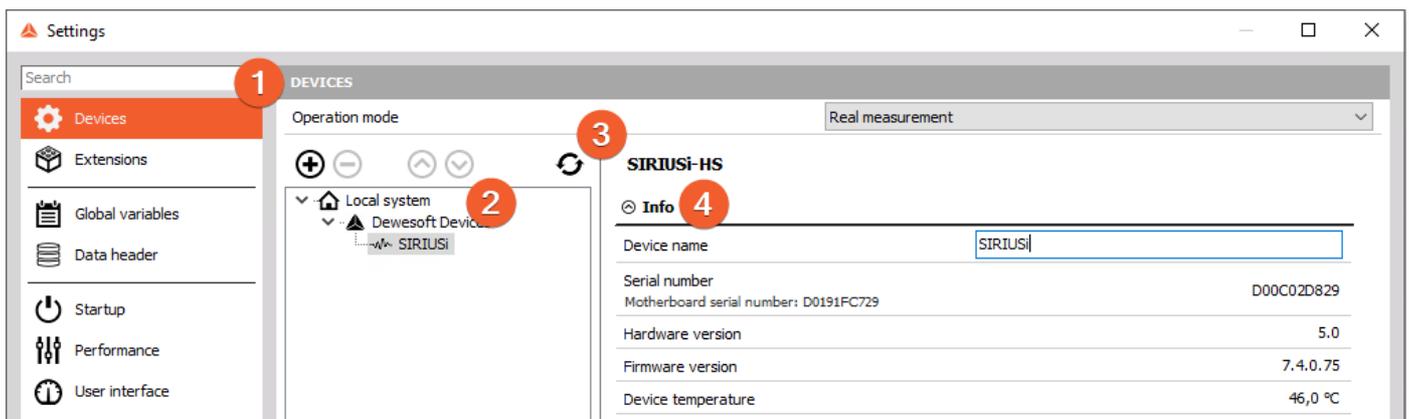
Real measurement mode

3.4.1. Counters and CAN

The use of analog inputs, CAN and digital interface is the same as with all other DAQ devices, which are supported in DewesoftX®. Please consult the DewesoftX® online-help for more information (see "Help - Manual").

3.5. Firmware upgrade

- Download the Dewesoft upgrade package (.dxu file) from the Dewesoft downloads page under the section Drivers.
- Copy the file into the Firmwares folder of your Dewesoft installation (e.g. D:\DewesoftX\System\Firmwares).
- Connect the Dewesoft instrument to the PC and run DewesoftX®.
- Go to settings under the Update tab:
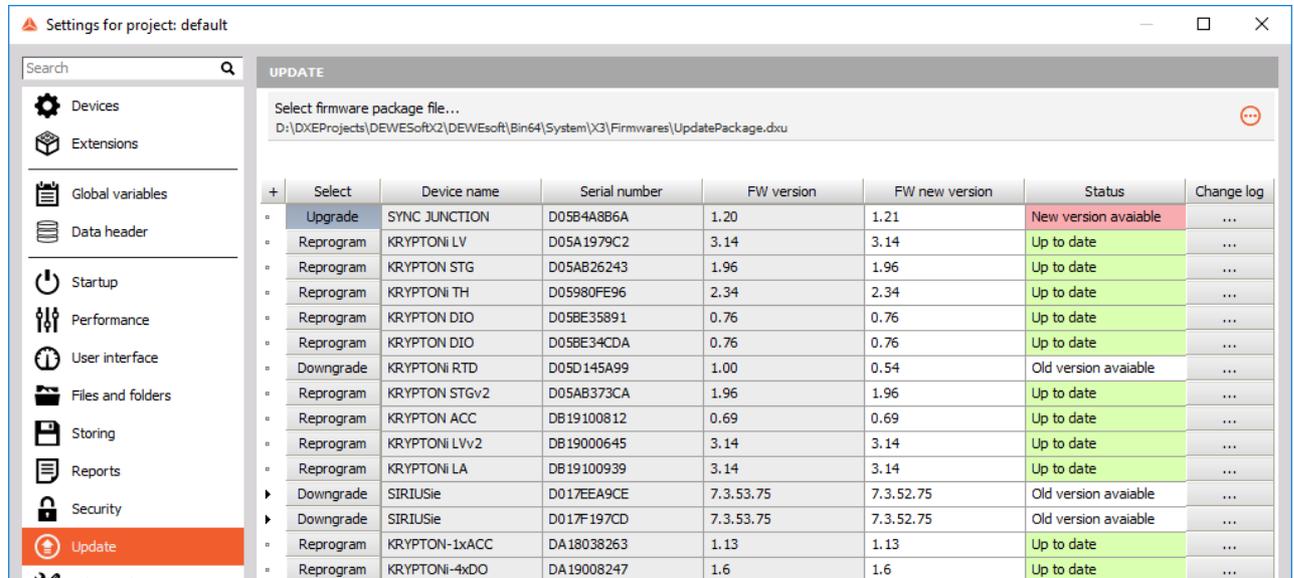
- If the firmware package isn't selected, select it by pressing the button and find the folder with the firmware file in it.
- Select the device you want to upgrade and start the firmware upgrade by pressing the "Upgrade" button.

3.6. Licensing

SIRIUS or any other Dewesoft device already comes with an embedded Dewesoft license. You can check the license details with all the available options in the Licensing tab ❶ by pressing the three dotted button ❻. However, if the user decides to upgrade the license with an additional extension, Dewesoft will require a new license registration. The registration can be made online ❷ or offline by importing an offline license ❺ in case the system doesn't have an internet connection. Offline license can be registered on a different PC with the internet connection. If needed, the license can also be written on the actual device ❺.

Active and embedded licenses are seen under Active licenses tab ❺. If the license is recognized as none active, it usually means that the wrong license was entered.
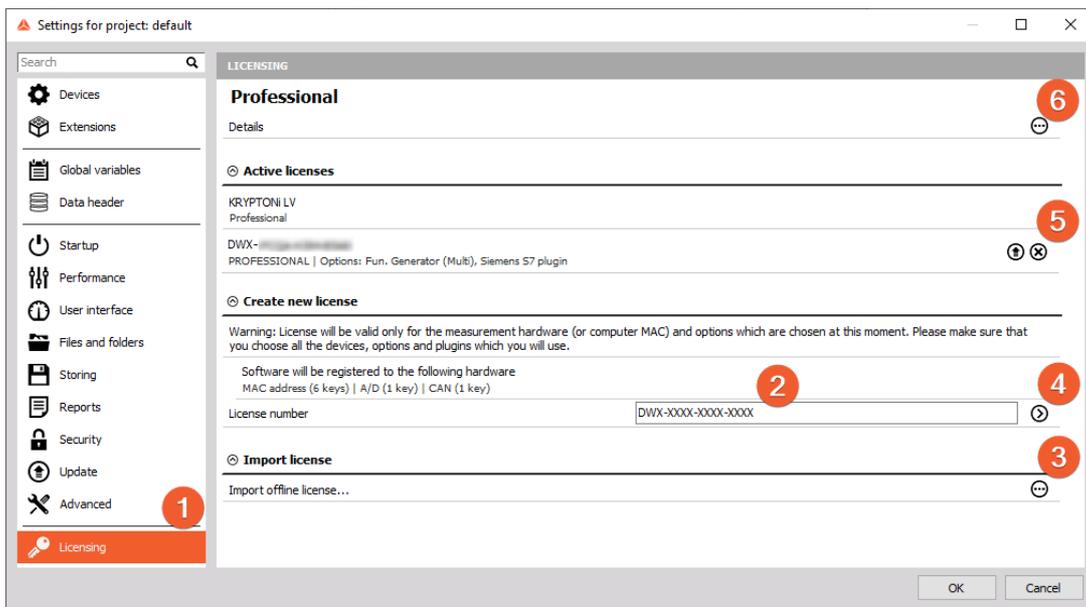
💡 **Hint**

All licenses regarding SIRIUS will only work when the SIRIUS system is connected to your PC and the device has been activated in the hardware setup.

3.7. Troubleshooting

If your SIRIUS® device is not found by DewesoftX®:
- If you did not restart Windows after the software installation, restart now
- Make sure, that you have started DewesoftX® version 7.1 or higher (7.0.x versions do not support SIRIUS®)
- Make sure that the external power supply is connected and okay
- Disconnect the USB / EtherCAT cable and reconnect it. If this does not work, try to connect the USB / EtherCAT cable to another USB/Ethernet port of your PC
- Check if Dewesoft USB device shows up in the Windows Device Manager (under the node called Universal Serial Bus controllers)
- Try to restart DewesoftX®
- Try to restart the PC
- Make sure to connect the data-cable directly to the Ethernet card of your PC. Do not use any switches or hubs

3.7.1. Additional instructions for troubleshooting with EtherCAT devices

If the computer is still having trouble recognizing the Dewesoft EtherCAT devices, here are some additional steps:

- Check if there is an Ethercat DAQ Filter driver installed on your computer like shown on the picture below. If the driver is installed, make sure the checkbox is checked in front of the driver.
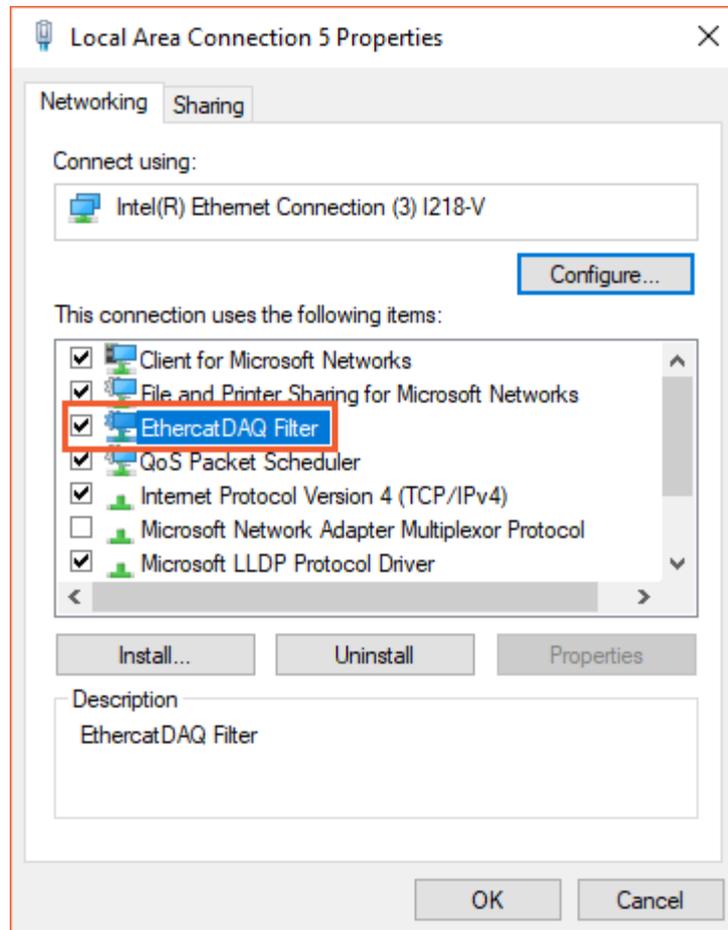
- If the driver is not installed, it can be downloaded from our web page.

📄 **EthercatDAQ Filter Driver v0.90**

Signed drivers (ver. 0.90 / 06/04/2017) for all Dewesoft EtherCAT devices. Works on Microsoft Windows 7, 8 and 10 (32 and 64 bit OS). Works only with Dewesoft X2 SP8 or newer. Warning: Please uninstall the old EthercatDAQ driver version before installing the new one.

- If the driver is already installed and the devices are still not recognized, the Speed & Duplex of the network card needs to be adjusted manually.
    - Go to network connections
    - Right-click on the connection where the EtherCAT devices are connected
    - Go to configure, advanced options, find Speed & Duplex, change the value to 100 Mbps Full Duplex
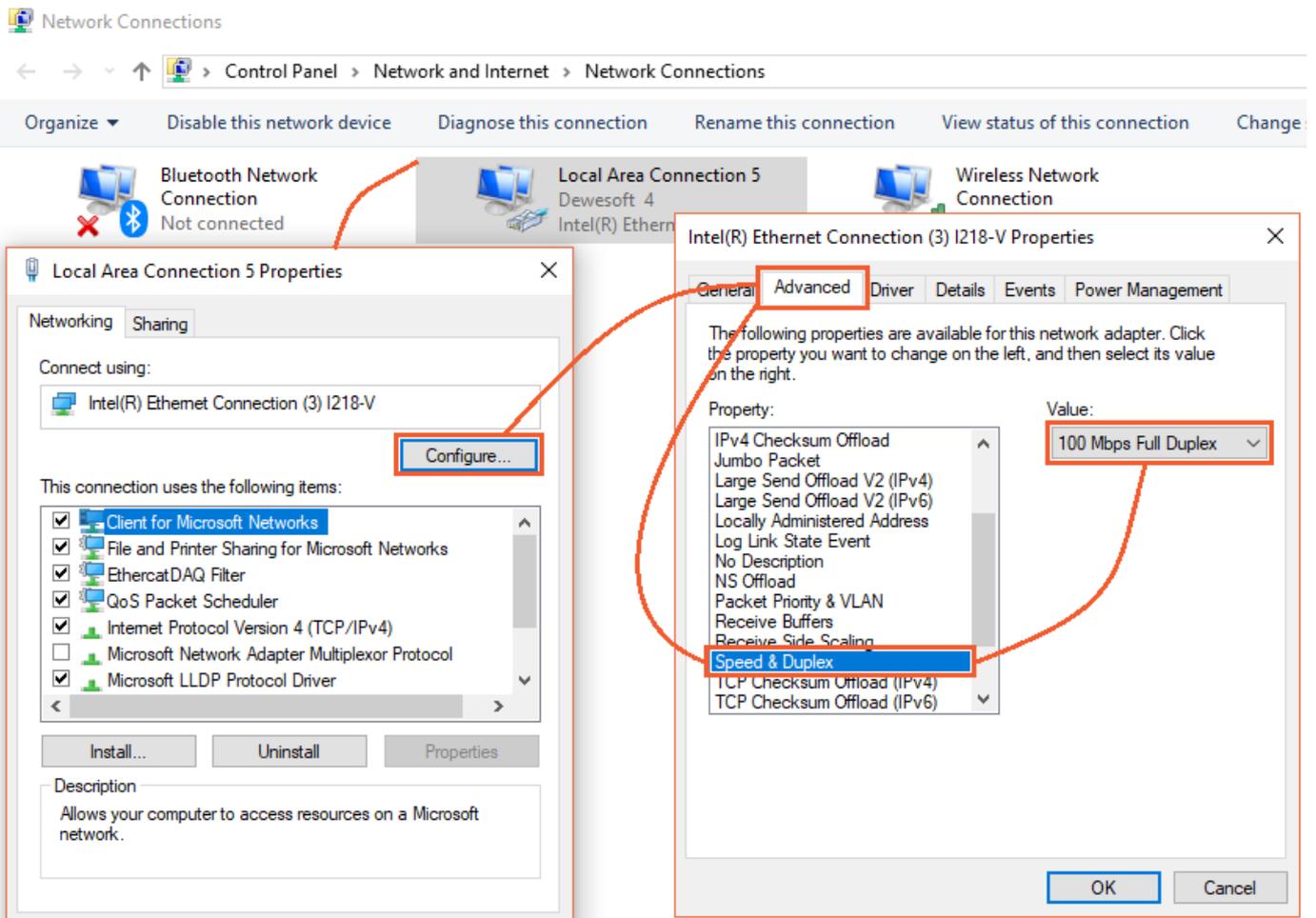
4. System Overview

SIRIUS

The world's most versatile USB and EtherCAT data acquisition system.
Any signal, any sensor, packed with cutting edge technology.

Voltage	Strain / Stress	Quarter Bridge	Half Bridge	Full Bridge	Thermocouple
Digital IO	IEPE	Charge	Current	Shock rating	RTD
Resistance	DSI Compatible	TEDS Compatible	EtherCAT	IP50	-10 °C to +50 °C
High Voltage	LVDT	Counter Encoder	CAN BUS	OBDII	J1939
Analog out	USB 2.0				

4.1. Main features

- USB/ETHERCAT INTERFACE: SIRIUS DAQ system can be connected via USB or EtherCAT to any Windows compatible PC or to one of our high-performance SBOX data loggers.
- ANY SENSOR: Array of different amplifiers are available that can acquire data from virtually any sensor on the market. IEPE, voltage, high voltage, charge, full / half / quarter bridge, LVDT, RTD, thermocouples, current, resistance, counter, encoder, and digital inputs are available.
- UNIVERSAL ANALOG INPUTS: Universal analog amplifiers can accept voltage and full / half / quarter bridge signals natively as well as IEPE, charge, thermocouples, RTD, current, resistance, and LVDT signals with the use of DSI adapters.
- 160 dB DYNAMIC RANGE: Our DualCoreADC® technology boosts dual 24-bit delta-sigma ADC's with an anti-aliasing filter on each analog channel, achieving astonishing 160 dB dynamic range in time and frequency domain with 200 kHz sampling rate per channel.
- 1 MHz SAMPLING RATE: A combination of software and hardware allows for acquisition speeds up to 1 MHz per channel on SIRIUS HS devices with real-time data processing and streaming to disk.
- HIGH ISOLATION: High channel-to-channel and channel-to-ground isolation prevents damage to the systems from excessive voltage and avoids ground loops.
- FLEXIBLE AND SCALABLE: SIRIUS DAQ system can grow with your needs. You can start with a single channel and scale the system to thousands of channels at any time.
- SENSOR POWER SUPPLY: Amplifiers provide channel-independent, programmable power supply for sensor excitation.
- DIGITAL/COUNTER/ENCODER INPUTS: Each channel is capable of 3x digital inputs, 1x event counter, encoder, period, pulse-width, duty-cycle, and precise frequency and angle measurement using patented SUPERCOUNTER® technology.
- ISOLATED CAN INPUT: High speed CAN 2.0b channels with 1 Mbit/sec data throughput with additional support for CCP, OBDII, J1939, and CAN output.
- ANALOG OUTPUTS/FUNCTION GENERATOR: SIRIUS slice can be configured with 8 analog outputs which can also function as a multi-channel function generator (software option upgrade required), analog replay, or control device with the output voltage signal of ±10 V.
- FULLY SYNCHRONIZED: Each channel, analog, digital, or CAN is synchronized with microsecond accuracy.
- SOFTWARE INCLUDED WITH FREE LIFETIME UPGRADES: The easy-to-use but rich in functionality, award-winning DewesoftX® software is included. All upgrades to the software are free forever with no hidden licensing costs.

This chapter contains all information about SIRIUS® systems. The various measurement modules have their own chapter: SIRIUS® Measurement Modules.

SIRIUS® is a data acquisition system, which offers the highest flexibility for inputs like the voltage, current, temperature, strain, vibration, pressure, counters, CAN and more. The data transfer to the PC can be done via USB or EtherCAT®.

The SIRIUS® system consists of Slices which contain up to 8 measurement Modules

Each SIRIUS® module typically has one analog channel. The HD-series has 2 channels per module. Some modules are available with an additional counter channel - those modules have a plus sign + at the end: e.g. SIRIUS ACC+ or, SIRIUS STGM+.

Optionally available is a version with 8 analog outputs on the rear side of a Slice.

Multiple Slices can be combined and synced together to get a multi-channel solution.

4.1.1. Naming of variants, suffix description

Important
See table below for SIRIUS, Rack and SBOX suffix descriptions / abbreviations.

Suffix	Device	Description
i	SIRIUSi	Isolated version
e	SIRIUSe SBOXe	EtherCAT version SBOX with integrated Sync Junction
f	SIRIUSf	Fanless version
r	SIRIUSr	Rack version
m	SIRIUSm	Mini 4-channel SIRIUS version
im	SIRIUSim	Isolated Mini 4-channel CAN SIRIUS version
ie	SIRIUSie	Isolated EtherCAT version
if	SIRIUSif	Isolated Fanless version
ir	SIRIUSir	Isolated Rack version
fe	SIRIUSfe SBOXfe	Fanless EtherCAT version Fanless SBOX with integrated Sync Junction
re	SIRIUSre SBOXre	EtherCAT version for Rack instruments SBOX with integrated Sync Junction for Rack instruments
se	SBOXse	EtherCAT version for Rack instruments Slim version
we	SIRIUSwe SBOXwe	Watertight EtherCAT version Watertight SBOX with integrated Sync Junction
ife	SIRIUSife	Isolated Fanless EtherCAT version
ire	SIRIUSire	Isolated Rack EtherCAT version
iwe	SIRIUSiwe	Isolated Watertight EtherCAT version
rt	Rack rt	Real Time EtherCAT slave port version
D	Rack d	Rack with display version
B	Rack b	Rack with battery power version
DB	Rack db	Rack with display and battery version

4.2. Enclosure Overview

SIRIUS® systems are available in different enclosure types. The following list provides a short high-level overview and the following sub-chapters cover the details.

- Modular Solution: Rugged slices with up to 8 measurement modules. This solution is very flexible because you can use each slice independently or combine multiple slices for a single measurement.
- Compact Systems: A compact box that can contain up to 4 measurement slices and an optional SBOX slice. This solution is more compact than using 4 single slices and also more convenient because all the slices are wired together internally: you don't need to interconnect the slices with external USB / Sync / Power / GND cables.
- Rack: A rugged solution for up to 8 measurement slices with integrated SBOX: This solution has all the advantages of the Boxed Solution, but double the channel count. Moreover, there are versions with integrated display and batteries available.
- Instruments: A rugged and portable solution including SBOX, display and optional batteries with 1 or 2 measurement slices.

Enclosure	Modular solution	Compact Systems				High-channel rack mountable systems			Portable all-in-one systems		Lab system
	SIRIUS	R4 / R4 HUB	R2 / R2 HUB	R2rt / R4rt	R1B / R2B	R8	R8D	R8DB	R2DB	R1DB	R3
Input type	ch-ch isolated (SIRIUSi), pair isolated (SIRIUSi HD) or differential slices (SIRIUS)										
Max SIRIUS slices	Flexible	4	2	2 / 4	1 / 2	8			2	1	3
Max DualCore/HS channels	8 per slice	32	16	16 / 32	8 / 16	64			16	8	24
Max HD channels (no counters possible)	16 per slice	64	32	16 / 32	16 / 32	128			32	16	48
Max counters	8 per slice	32				64			16	8	24
Max digital input/digital outputs	24 DI / 8 DO	96 DI / 32 DO				192 DI / 64 DO			48 DI / 16 DO	24 DI / 8 DO	72 DI / 24 DO
Analog out	Only USB with fan	Yes	Yes		No	Yes	No		No		Yes
Max CAN ports	1	4	2		1	8			2	1	
Computer system	Optional SBOXe, SBOXfe	Integrated SBOXse				Integrated SBOXre			Integrated SBOXse		Standard PC
Display	External (MOB DISP 12)	External				External	Integrated 17" Full-HD		Integrated 12" Full-HD		External
Batteries	External BP2i, BP4i	External BP2i, BP4i				External BP2i, BP4i		Integrated	Integrated		-
Power Supply	9-36 V DC	12-36 V DC	12-36 V DC	12-36 V DC	12-36 V DC	12-36 V DC	12-36 V DC	18-24 V DC	9-36 V DC	9-36 V DC	110 V / 220 V AC

4.2.1. Modular solution

A single SIRIUS® slice can have up to 8 measurement modules.
Each measurement module typically has one analog channel. Some modules also have an optional counter channel (e.g. ACC+). HD modules have 2 analog channels.
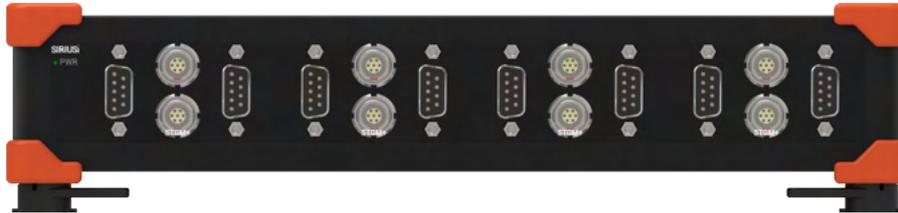
SIRIUSi-8xSTGM+

We offer several standard chassis with predefined modules, but you can also choose a customized slice with any combination of the SIRIUS® measurement modules.
You can choose between 2 different data-transfer options:
- USB
- EtherCAT®

Hint

You can use your SIRIUS® slices independently or combine them to a single fully-synchronized multi-channel measurement system with the clever click mechanism.

4.2.1.1. Single slice: USB

This chapter describes the SIRIUS® USB single slice enclosure.

Important
The LED indicator on the front side shows system status.

LED status	Description
Green	Power is connected, system self-test PASSED.
Red Blinking	Power is connected, system self-test error! - RAM - I2C bus (PLL, Temperature) - CAN (optional) - EtherCAT (optional)
Green Blinking	"Easy device identification" feature. When selected in the setup, the corresponding SIRIUS Green LED indicator is blinking.

4.2.1.2. Single slice: Rear side

The SIRIUS® USB chassis has following connectors at the rear side:

SIRIUS rear side

Name	Description
CAN	CAN bus DSUB-9 male connector
SYNC	Two 4-pin LEMO female sync connectors
USB	USB-mini to transfer the data to the SBOX or PC
GND	Protective Ground banana plug and M4 screw insert.
POWER IN	2-pin LEMO male connector
POWER OUT	2-pin LEMO female connector

Analog-out connectors

The optional analog output version of the SIRIUS Single Slice has 8 additional BNC connectors for the analog output channels on the rear side (for detailed information see chapter: Analog out option).

Rear side connectors of the analog-out version

4.2.1.3. Single slice: EtherCAT®

The following Illustration shows the connectors on the rear side of the SIRIUS® EtherCAT® slice.

SIRIUS® EtherCAT® rear side

Name	Description
Status LED light	L means Link: i.e. the In- (left L-LED) or Out-connector (right L-LED) is linked to another slice or to the measurement PC. D is for Data: it is active only when the data transfer is active this requires that power is connected AND the slice is linked to another slice or a PC.
EtherCAT IN and OUT	8-pin EtherCAT connectors.
USB Mini	The USB 2.0 Mini connector can optionally be used to increase the data throughput of the EtherCAT® device i.e. the data can be transferred via EtherCAT® and USB at the same time to get data rates that are not possible with EtherCAT® alone. Note: when you use multiple slices, then DewesoftX® must be the EtherCAT® master.
GND	Protective Ground banana plug and M4 screw insert.

4.2.2. Extended height enclosure

Some modules may require a higher enclosure, depending on the connector type.

The extended height enclosures are available for the Single and for the Boxed Solution only (not for Rack, etc.).

Extended height enclosure

4.2.3. Rack enclosure

SIRIUS Slices are also available as modular rack system versions.

Important

Notes for the rack series:

- SIRIUSr Rack slices can be changed between different Rack enclosures (R2, R4, R3, R8).
- Depending on original configuration Rack slices will be orientated either horizontal or vertical (settings and front panel engravings).
- All R8 rack versions contain an integrated PC and you can choose up to 8 SIRIUS® measurement slices.
- R2 and R4 instruments can be equipped either with SBOX PC or USB HUB.
- All module combinations are possible (except for the Extended Height Enclosure modules) The Dual-Core series can be mixed with HD (High Density) and HS (High Speed) modules. You can even mix isolated and differential slices.
- All slices are internally connected to SBOX PC via USB / Sync / Power / GND.
- In comparison to the Modular Solution, the Rack has the CAN connectors on the same side as the analog channels, except HD where CAN connector is not possible.
- The analog output option is available only for the SIRIUS-R8 (the other Rack versions have the display where the analog output would be).
- The analog output option is also available on SIRIUS-R2 and R4.
- R2, R4 and R8 instruments can be also configured with EtherCAT Slave ports.
- Please see individual chapters in this manual for details.

SIRIUS® Rack slice

SIRIUS® Rack with 8 measurement slices

4.2.4. Mini enclosure

SIRIUS MINI is a small and highly portable, USB powered data acquisition system ideal for acoustic, vibration, and rotating machinery analysis.

SIRIUS® mini enclosure

4.3. Miscellaneous

4.3.1. Click mechanism

You can use the SIRIUS slices independently or combine them to a single fully-synchronised multi-channel measurement system. The clever Click mechanism makes it easy to physically attach modules to each other. Click mechanism is available for Modular Solutions, Hub Solutions, SIRIUS Mini, SIRIUS PCM, SIRIUS-SBOXe, SIRIUS-SBOXfe and some accessories e.g. Battery Packs and Mounting plates.

To lock two SIRIUS modules turn all four tabs on the bottom of the module into the open position. Now fit the module right above the fitting of the second module and stack it together as shown in the picture below ❶. Make sure that it fits well and then turn the four tabs towards the inside of the module to hear the click ❷.

The steps of how to stack the SIRIUS modules with the Click mechanism

Options of using the SIRIUS Click mechanism

4.3.2. Side holder for Krypton DAQ

R2DB, R1DB, R1B and R2B devices are equipped with a side holder for mounting Krypton devices.

Option of using the click mechanism for Krypton devices

Below is an example of a Krypton-TH mounted on a R2DB.

Important
For this connection you need a custom L1T8m-L1T8f-Xm, where the length shouldn't be less than 0.8m.

KRYPTON-3xSTG mounted on R2DB

The procedure of mounting a KRYPTON device to SIRIUS system

4.3.3. 19" Mounting Kit for SIRIUS R1x, R2x

We have a mounting kit available and it fits R1DB, R1B, R2DB, R2B, R2D.

R2DB mounted on 19'' mounting kit

4.3.4. USB hubs vs. native ports

USB, short for Universal Serial Bus, is an industry standard that defines the cables, connectors and communications protocols.

USB 2.0 has a theoretical maximum bandwidth of 480 Mbit/s (High Speed or High Bandwidth). Due to bus access constraints, the effective throughput of the High Speed signalling rate is limited to about 30 MB/s.

The SIRIUS slices use the USB 2.0 protocol for communication to the PC/SBOX and they have USB Type A receptacles. This is enough, even for 8 SIRIUS high-speed channels @ 1MS/s.
USB 3.0 a new SuperSpeed transfer mode, with associated new backwards-compatible plugs, receptacles, and cables. The SuperSpeed plugs and receptacles have blue inserts (in comparison to the black ones of USB 2.0). The theoretical maximum data signalling rate of the new SuperSpeed mode is 5.0 Gbit/s. However the specification considers it reasonable to achieve only around 3.2 Gbit/s (0.4 GB/s or 400 MB/s).

A USB hub is a device that expands a single native USB port into several, so that there are more ports available to connect devices.

If a USB hub is used, the USB bandwidth is shared by the connected USB devices (i.e. SIRIUS® slices) and thus you may not be able to use the max. possible sampling rate (of the SIRIUS slice). Note, that also the USB connectors on laptops are often internally connected to a USB hub.

SIRIUS slices should always be connected to the native ports, so that you can use the maximum sampling rate without USB hub bandwidth limitations

Hint

You only need to care about native ports and hubs when you use external USB ports of the SBOX. The internal USB connections (e.g. in the SIRIUS RACK Systems), are optimised that single measurement slice can use the full maximum sampling rate: for all 64 (dual-core, high-speed) channels or 128 (high-density) channels.

4.3.5. GPS option

The table shows the specifications of the optional GNSS receivers that you can order for your SBOX (including R8, R8DB, etc.).

See chapter: GPS Connector (DSUB-9).

GPS receiver		10 Hz	100 Hz	
RTK		NO	NO	YES
Update rate		10 Hz	1-100 Hz programmable	
WAAS / EGNOS / MSAS		-	Yes	Yes
Signal tracked				
GPS		L1	L1	L1, L2, L2C
GLONASS		L1	L1	L1, L2, L2C
SBAS		Yes	Yes	Yes
Accuracy	**Positioning**			
Stand-alone	horizontal	2.5 m	1.2 m	1.2 m
	vertical	3 m	1.8 m	1.8 m
SBAS	horizontal	1 m	0.8 m	0.8 m
	vertical	3 m	1.2 m	1.2 m
DGBS	horizontal	-	0.3 m	0.3 m
	vertical	-	0.5 m	0.5 m
RTK	horizontal	-	-	±2 cm
	vertical	-	-	±2 cm
Velocity		1 km/h	0.1 km/h	0.1 km/h
PPS Accuracy		50 nsec	30 nsec	30 nsec
RTK				
RTK initialization time		-	-	< 10 sec
RTK initialization reliability		-	-	> 99 %
Correction data input		-	-	RTCM SC104 2.x and 3.x, CMR, CMR+
Acquisition time				
Hot start		< 3 s	< 10 s	< 10 s
Cold start		< 30 s	< 60 s	< 60 s
Limitations				
Velocity		500 m/s	514 m/s	514 m/s
Acceleration		5 g	20 g	20 g
Altitude		18000 m	18000 m	18000 m

4.3.5.1. RTK

RTK (Real Time Kinematic) option is only available for the 100 Hz receiver. With this option it is possible to get an accuracy of 2 cm.

For details, please refer to the "RTK Manual" on our download page:
http://www.dewesoft.com/downloads

Upgrading to RTK

When your SBOX already has a 100 Hz GPS receiver the upgrade to the 100 Hz + RTK Option can easily be done. It just requires an upgrade to the software license. Since no hardware change is needed, this can be done at the customers site.

4.3.6. USB support on SBOX for different SIRIUS modules
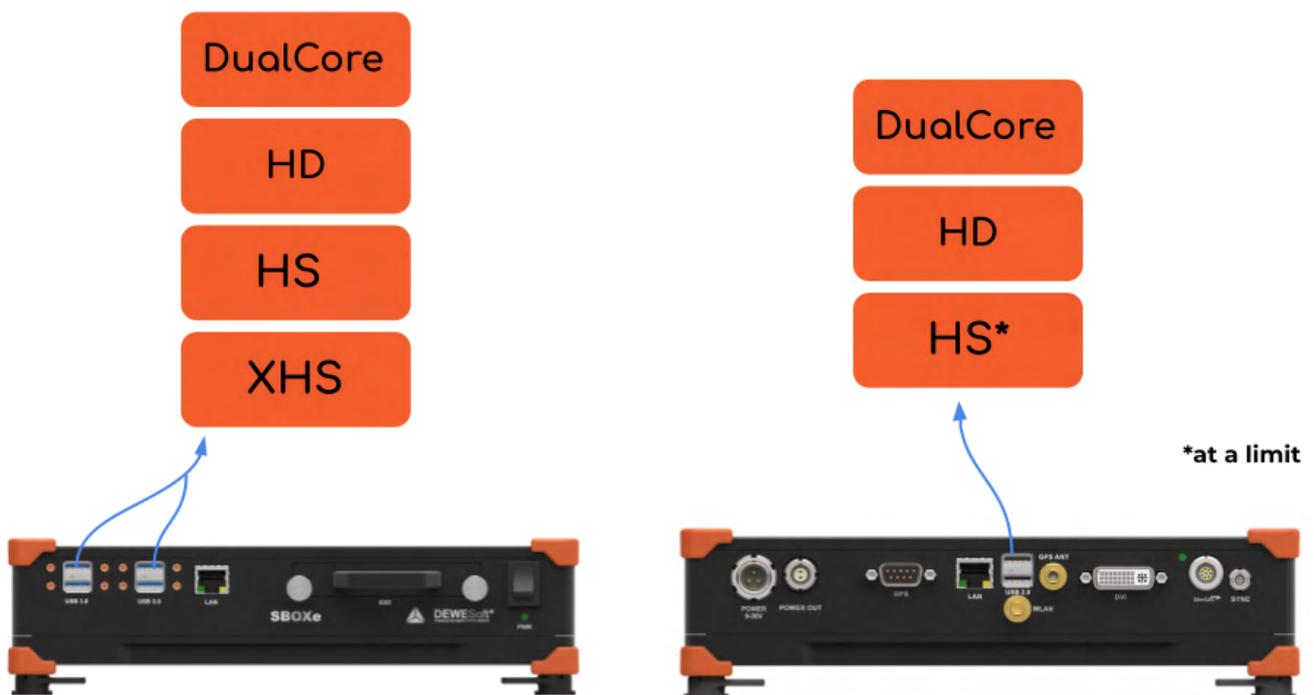
SBOXe Front side (left) and Rear side (right)

4.4. Connectors

4.4.1. General

4.4.1.1. USB Connector

USB connectors are used by:
- SIRIUS® measurement slices to transfer the measurement data to the SBOX (or PC)
- SIRIUS® SBOX: to connect SIRIUS® USB slices or other USB devices. The USB connector can transfer data and provide power to connected devices (5 VDC)

SIRIUS® SBOX: to connect SIRIUS® USB slices or other USB devices. The USB connector can transfer data and provide power to connected devices (5 VDC)

USB 2.0 has a maximum signalling rate of 480 Mbit/s (High Speed or High Bandwidth).
The Illustrations to the right show a Mini and Standard size USB 2.0 sockets.
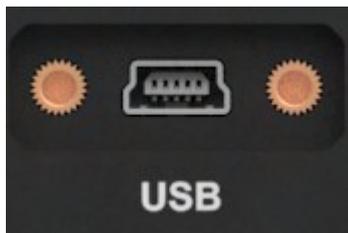
USB 2.0 Mini   *2x USB 2.0*

USB 3.0 "SuperSpeed" has backwards-compatible plugs, receptacles, and cables.
SuperSpeed plugs and receptacles are identified with a distinct logo and blue inserts in standard format receptacles.

Hint

DewesoftX® USB cables have thumb screws to the right and left of the connector so that you can firmly secure the USB cable.

2x USB 3.0

4.4.1.2. Power in connector
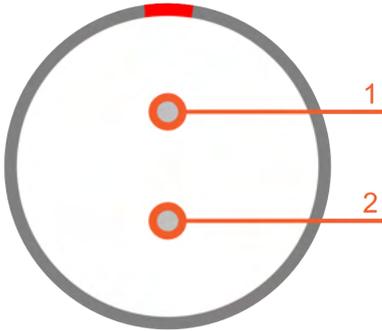
Pin	Name	Description
1	V +	Supply
2	V -	Ground

Power in connector: pin-out (2-pin LEMO male)

Power In connector (on the device): EXJ.1B.302.HLD
Mating connector (for the cable): FGJ.1B.302.CLLD52Z

4.4.1.3. Power out connector
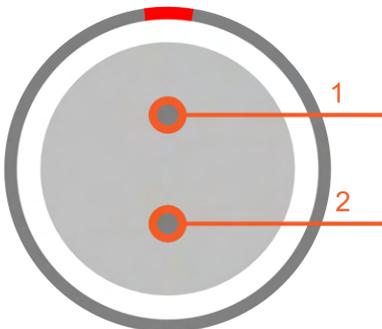
Pin	Name	Description
1	V+	Supply
2	V-	Ground

Power out connector: pin-out (2-pin LEMO female)

Power Out connector (on the device): EXG.1B.302.HLN
Mating connector (for the cable): FGG.1B.302.CLAD52Z

The Power Out power plug can be used to daisy-chain several devices together.
Daisy chain cable: L1B2m-L1B2f

5.4.1.2. EtherCAT® connector

The EtherCAT® connector can provide power and transfer the measurement data plus synchronisation signal in one single cable. SIRIUS® EtherCAT® slices have 2 connectors, so that you can easily chain multiple slices together.

EtherCAT IN connector: pin-out (8-pin LEMO male)
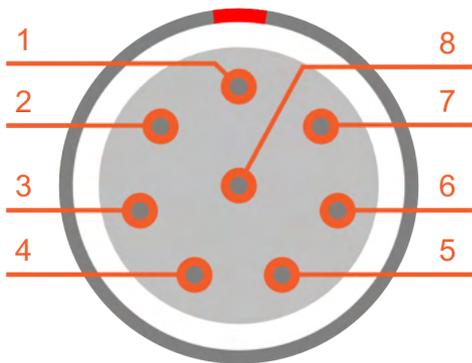
EtherCAT OUT connector: pin-out (8-pin LEMO female)

Pin	Name	Description
1	TX_P	Transmission +
2	TX_N	Transmission -
3	RX_P	Reception +
4	RX_N	Reception -
5	VCC	PWR OUT
6	VCC	PWR OUT
7	GND	Ground
8	GND	Ground

Connectors (on the device):
EGG.1T.308.CLN LEMO 8-pin female
EGJ.1T.308.CLD LEMO 8-pin male

Mating connector (for the cable):
FGG.1T.308.CLA.1433 cable, MALE
FGJ.1T.308.CLL.1433 cable FEMALE

4.4.1.5. EtherCAT® slave port

DAQ AND CONTROL: R_rt instrument is an upgrade of the Rack DAQ system. It uses the same DAQ technology, data logging, and data processing capabilities, but includes an additional EtherCAT slave port that can send the real-time data feed to any 3rd party EtherCAT master controller.

Important

List of supported systems		
R2rt	R4rt	R8rt

DUAL MODE: EtherCAT slave interface can be used to provide real-time data to a 3rd party control system while the Internal bus allows full-speed data recording to Dewesoft X software in parallel, serving both worlds of data acquisition and control which have been so far separated.
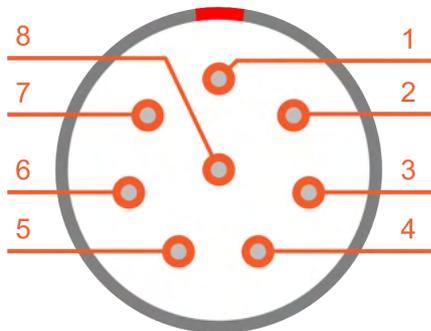
EtherCAT SLAVE IN connector: pin-out (8-pin LEMO male)
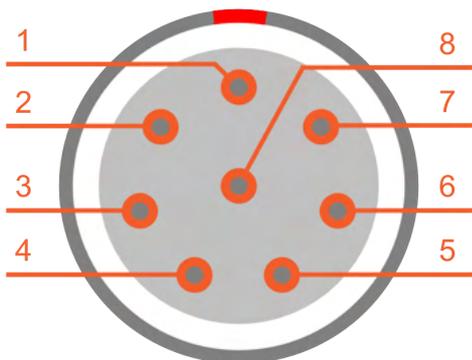
EtherCAT SLAVE OUT connector: pin-out (8-pin LEMO female)

Pin	Name	Description
1	TX_P	Transmission +
2	TX_N	Transmission -
3	RX_P	Reception +
4	RX_N	Reception -
5	VIN+	Power (see 1)
6	VIN+	Power (see 1)
7	VIN-	Ground (see 1)
8	VIN-	Ground (see 1)

1) VIN+ and VIN- are not connected to internal Power or Ground signals. Only pass-through between IN / OUT connectors is made.

Connectors (on the device):
EGG.1T.308.CLN LEMO 8-pin female
EGJ.1T.308.CLD LEMO 8-pin male

Mating connector (for the cable):
FGG.1T.308.CLA.1433 male
FGJ.1T.308.CLL.1433 female

4.4.1.6. SYNC connector

Sync cable

The sync connectors are required when you want to use multiple SIRIUS® USB slices for the same measurement. The signal that is transferred over this cable makes sure that the measurement data of the different slices are perfectly synchronized to each other.

Sync connectors have 2 use-cases:

- SBOX: When you have an SBOX with GPS option, you can use the SBOX as a clock master. In this case the SBOX will use the GPS signal to generate the synchronization signal for the attached measurement modules: e.g. the SIRIUS-SBOXe has one sync connector at the front.
- SIRIUS® USB slices: When there are 2 connectors it's easy to chain several SIRIUS® chassis (or DEWE-43, DS-CAN2, etc.) together.
  Note that there is no distinction between the IN and OUT – it does not matter which connector you use.
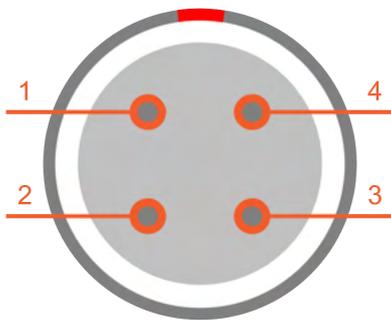
Sync connector: pin-out (4-pin LEMO female)

Pin	Name	Description
1	CLK	Clock
2	Trigg	Trigger
3	GPS-PPS	GPS - PPS
4	DGND	Digital Ground

Interface connector: EEG.00.304.CLL
Mating connector: FGG.00.304.CLAD27Z

Important
When IRIG-synchronisation is used, the IRIG differential signals are on pins 1, 2.
When Clock / Trigger is used, the signals are on pins 1, 2.
When PPS-GPS synchronization is used, the PPS signal is on pin 3.

4.4.1.7. CAN connector

A Controller Area Network (CAN bus) is a vehicle bus standard often used in automotive applications. SIRIUS slices usually have a CAN connector on the back side, while Rack version on the front side.
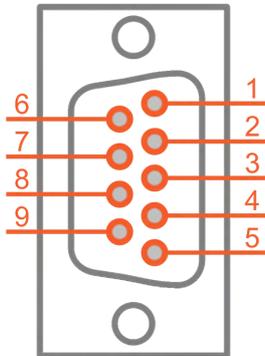
CAN connector: pin-out (DSUB-9 male)

Pin	Name	Description
1	+5V	5 V supply max. current: 500 mA
2	CAN_LOW	CAN low
3	DGND	Digital Ground
4	RES	Reserved
5	RES	Reserved
6	DGND	Digital Ground
7	CAN_HIGH	CAN high
8	RES	Reserved
9	+12V	12 V supply max. current: 200 mA

4.4.1.8. GND connector

For correct measurements, it is highly recommended to ground the SIRIUS®. The GND connector is usually a banana connector. There may also be a screw connector: e.g. SIRIUS-R8.

! Warning

It is mandatory to connect a ground cable to the GND connector when you are working with high voltages: e.g. when you are working with the HV modules.

4.4.2. SBOX common connectors

4.4.2.1. GPS connector (DSUB-9)

Used for connecting RTK modem or display:
- External VGPS-DISP can be connected to receive and display NMEA parameters if internal GNSS receiver is used (TOPCON)
- RTK modem (RF or LTE) can be connected to receive or transmit RTK corrections if RTK license is available on the receiver
- GNSS receiver can work as an RTK rover (receive RTK data) or as a base station (transmit RTK data)

Important

GPS port A is used for VGPS-DISP or for the RTK-modem when the RTK option is in use.
GPS port-D is reserved. Do not connect!

4.4.2.1.1. 10Hz GPS option
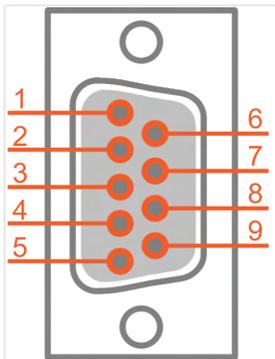
GPS connector: pin-out (DSUB-9 female)

Pin	Name	Description
1	+5V	+5 V (max. 0.5 A) See 1.
2	Tx Ch A	RS232 display (NMEA)
3	Rx Ch A	Not connected
4	PPS	GPS PPS
5	GND	Ground
6	Remote-On	Remote-On
7	Rx Ch D	Not connected
8	Tx Ch D	Not connected
9	+12V	+12 V (max. 0.5 A) See 1.

1. The voltages and the Remote-On features are always available, but the GPS data and PPS are only available when you have one of the GPS options.

4.4.2.1.2. 100Hz GPS option
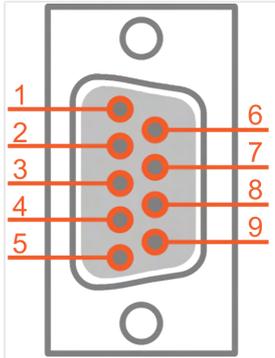
GPS connector: pin-out (DSUB-9 female)

Pin	Name	Description
1	+5V	+5 V (max. 0.5 A) See 1.
2	Tx Ch A	TXD GPS port A
3	Rx Ch A	RS232 RTK
4	PPS	GPS PPS
5	GND	Ground
6	Remote-On	Remote-On
7	Rx Ch D	RXD GPS port D
8	Tx Ch D	TXD GPS port D
9	+12V	+12 V (max. 0.5 A) See 1.

1. The voltages and the Remote-On features are always available, but the GPS data and PPS are only available when you have one of the GPS options.

4.4.2.2. GPS antenna connector

GPS is only available when you have an SBOX with GPS Option.

Connect the GPS Antenna to the GPS ANT RP-SMA Female Jack connector and make sure that there is an unobstructed line of sight to four or more GPS satellites.

The Global Positioning System is a satellite-based radionavigation system. It is one of the global navigation satellite systems (GNSS) that provides geolocation and time information to a GPS receiver anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites.

4.4.2.3. Ethernet connector (RJ45)

The standard Ethernet Connector can be used to connect your SBOX to LAN network.

When you use a Power Junction box you can also use the standard Ethernet connector to operate EtherCAT® devices (e.g. SIRIUS® EtherCAT® Slices or KRYPTON®).

4.4.2.4. Power in connectors

Please see specifications of individual SBOX models for details.

4.4.2.4.1. SBOX power in connector
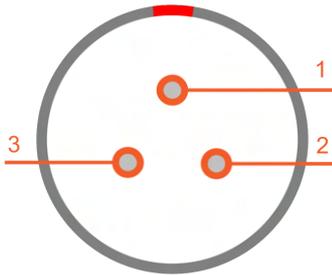
Pin	Name	Description
1	V +	Supply
2	GND	Ground
3	Remote - On	Remote - On pin

Power in connector: pin-out (3-pin LEMO male)

Power connector (on the SBOX): ECJ.2B.303.CLA
Mating connector (for the cable): FGJ.2B.303.CLLDxx

To power the system on / off, press the Power switch, or use the Remote-On pin on the Power or GPS connector.

4.4.2.4.2. SBOXre power in connector
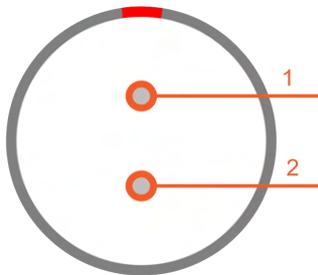
Pin	Name	Description
1	V +	Supply
2	GND	Ground

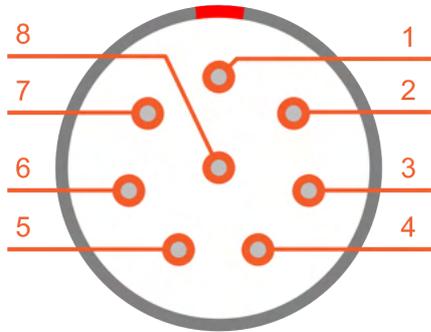*Power in connector: pin-out (2-pin LEMO male)*

Power connector (on the SBOX): ECJ.2B.302.CLA
Mating connector (for the cable): FGJ.2B.302.CYMD92

Important
Only for R8, R8D, R8B and R8DB instruments.

4.4.2.5. Remote-On

If the SBOX system is used, the remote mode can be used to turn the SBOX on or off from the remote distance.

Important

To power the system on, press the Power switch OR apply a voltage between 4 V and 30 V to the Remote-On pin. To power off the system press the Power switch or reduce the voltage on Remote-On below 0.5 V for more than one second.

Remote-On functionality can be set to various options, see details below.

⊗ **SBOXwe system**	
Serial number	D00C9BD43B
System serial number	
Hardware version	2.5.0.0
Firmware version	3.7
Remote mode To power on/off the system on remote external pin	Disabled ▼

DewesoftX® settings, SBOX system

Remote mode To power on/off the system on remote external pin	Disabled ▼ Disabled Remote power on on external pin Remote power on and off on external pin
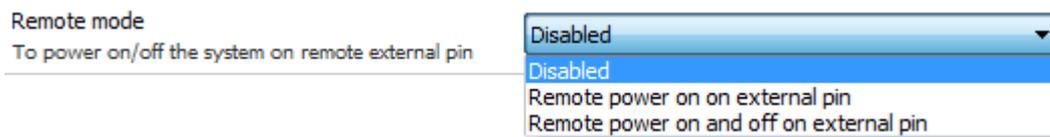
- Disabled - If the remote mode is disabled, SBOX can only be turned on or off by pressing the power button on the device.
- Remote power ON on external pin - The SBOX can be remotely turned on. "Remote on" HIGH signal level (>4V) will turn the SBOX on and boot operating system. SBOX can only be turned off by pressing the power button on the device.
- Remote power ON and OFF on external pin - The SBOX can be remotely turned on or off. "Remote on" HIGH signal level (>4V) will turn the SBOX on and boot operating system. The signal must remain HIGH during operation. "Remote on" LOW signal level <0.5V will safely shutdown the operating system and turn the SBOX off.

Important

After the Remote mode option is changed, a total reset of the device is required. The SBOX needs to be shut down and disconnected from the power supply. If the SBOX is also powered by batteries (e.g. R1DB, R8B,..) then the batteries need to be removed as well. The setting will become permanently enabled after a total reset.

4.4.3. VGPS-DISP

Display is compatible with 10Hz and 100Hz GPS receivers.

VGPS-DISP external display

The VGPS-DISP display can be directly connected to any of our GPS devices and will display:

- speed,
- heading,
- altitude,
- time, and
- number of satellites in reach.

4.4.3.1. VGPS – Display connector
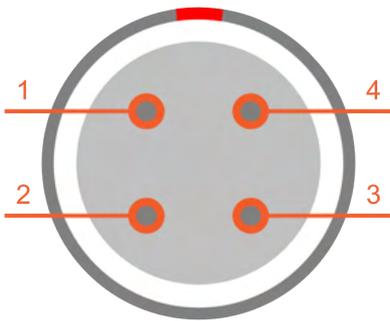
VGPS-DISP connector: pin-out (4-pin LEMO female) EXG.1B.304.HLN

Pin	Name	Description
1	V +	Supply
2	GND	Ground
3	Tx Ch A	TXD
4	Rx Ch A	RXD

4.5. SIRIUS-SBOX

The SIRIUS-SBOX is an integrated powerful PC in a rugged SIRIUS® chassis: with an Intel® Core™ processor and a fast SSD drive. The SIRIUS-SBOX is available in different versions and enclosures: as a standalone single slice or integrated in a Boxed Solution, Rack, etc.
The following chapters will describe the different versions in detail.

General SBOX features:
- High speed CPU Powerful Intel® Core™ processor
- High speed interfaces
  USB 3.0 (nearly 10 times faster than USB 2.0) and
  LAN interfaces provide highest bandwidth for data-transfer
- EtherCAT® interface
  Directly connect SIRIUSe devices. You only need one cable for power, synchronization and data.
- Removable High speed SSD
  The high-speed Solid State Disk is fast enough for transient recording of measurement data and external high-speed videos at the same time.
- Flash option
  For even better performance and maximum safety and convenience, we recommend separating the operating system from the measurement data.
  With the SBOX-FLASH250 option, the operating system is stored on an internal flash disk with 250 GB, while the measurement data is stored on the exchangeable SSD. This allows you to quickly change the SSD (where your valuable data is stored). This feature also allows users to continue storing on a new media immediately.

SBOXe with removable SSD

4.5.1. SIRIUS-SBOXe/fe: Specifications

The SIRIUS-SBOXe version is an SBOX with EtherCAT® interface. It is available in Modular and rack Solution .

Important

In 2022, SBOXe was upgraded with a more powerful Intel® Core™ processor. Specifications of both versions are in the table below.

	SBOXe	SBOXfe
Computer		
Processor	Intel® Core™ i5 (I5-1145G7E) - Kontron 36030-0000-15-5 4x 1.5 GHz base, 4.1 GHz max 8 threads	Intel® Core™ i7 2x 1.7 GHz base, 2.8 GHz max 4 threads
Memory	8 GB (optional up to 32 GB)	8 GB (optional up to 16 GB)
Storage	500 GB removable SATA SSD Option: up to 4 TB removable SATA SSD Option: up to 1 TB NVMe internal SSD	500 GB removable SATA SSD Option: 1 TB removable SATA SSD Option: 250 GB mSATA internal SSD
Interfaces and options		
USB	Front: 4x USB 3.0, Rear: 2x USB 2.0	Front: 4x USB 3.0, Rear: 2x USB 2.1
Ethernet	2x 2.5GLAN, 1x WLAN	2x GLAN, 1x WLAN
EtherCAT®	1x EtherCAT® 100 Mbps Full Duplex, 8-pin LEMO female	1x EtherCAT® 100 Mbps Full Duplex, 8-pin LEMO female
Synchronisation	1x SIRIUS® SYNC	1x SIRIUS® SYNC
Video	1x DVI (VGA and HDMI compatible)	1x DVI (VGA and HDMI compatible)
GPS (option)	10 Hz, 100 Hz, 100 Hz & RTK	11 Hz, 100 Hz, 100 Hz & RTK
GPS display (option)	External on DSUB-9 female connector with remote power on	External on DSUB-9 female connector with remote power on
Power out	Switched input supply on 2-pin LEMO female, 8 A (shared with EtherCAT® connector)	Switched input supply on 2-pin LEMO female (max. 8 A)
Power		
Power supply voltage	9 - 36 V DC	9 - 36 V DC
Power consumption	Typ. 40 W (Max. 55 W)	30 W Max.
Environmental		
Operating temperature	-10 to 50 °C	-10 to 50 °C
Storage temperature	-20 to 80 °C	-20 to 80 °C
Humidity	5 to 95 % RH non-condensing at 50 °C	5 to 95 % RH non-condensing at 50 °C
IP rating	IP20	IP50
Shock & Vibration	Vibration sweep sinus (EN 60068-2-6:2008) Vibration random (EN 60721-3-2: 1997 - Class 2M2)	Vibration sweep sinus (EN 60068-2-6:2008) Vibration random (EN 60721-3-2: 1997 - Class 2M2)

	Shock (EN 60068-2-27:2009) MIL-STD-810D	Shock (EN 60068-2-27:2009) MIL-STD-810D
Physical		
Dimensions	265 x 150 x 75 mm	265 x 150 x 80 mm
Weight	2.1 kg	2.4 kg

	SBOXe	**SBOXe v2**
Computer		
Processor	Intel® Core™ i7 4x 2.0G Hz base, 2.8 GHz max 8 threads	Intel® Core™ i5 (I5-1145G7E) - Kontron 36030-0000-15-5 4x 1.5 GHz base, 4.1 GHz max 8 threads
Memory	8 GB (optional up to 32 GB)	8 GB (optional up to 32 GB)
Storage	500 GB removable SATA SSD Option: 4 TB removable SATA SSD Option: 250 GB mSATA internal SSD	500 GB removable SATA SSD Option: up to 4 TB removable SATA SSD Option: up to 1 TB NVMe internal SSD
Interfaces and options		
USB	Front: 4x USB 3.0, Rear: 2x USB 2.0	Front: 4x USB 3.0, Rear: 2x USB 2.0
Ethernet	2x GLAN, 1x WLAN	2x 2.5GLAN, 1x WLAN
EtherCAT®	1x EtherCAT® 100 Mbps Full Duplex, 8-pin LEMO female	1x EtherCAT® 100 Mbps Full Duplex, 8-pin LEMO female
Power out	Switched input supply on 2-pin LEMO female (max. 8 A)	Switched input supply on 2-pin LEMO female, 8 A (shared with EtherCAT® connector)
Synchronization	1x SIRIUS® SYNC	1x SIRIUS® SYNC
Video	1x DVI (VGA and HDMI compatible)	1x DVI (VGA and HDMI compatible)
GPS (option)	10 Hz, 100 Hz, 100 Hz & RTK	10 Hz, 100 Hz, 100 Hz & RTK
GPS display (option)	External on DSUB-9 female connector with remote power on	External on DSUB-9 female connector with remote power on
Power		
Power supply voltage	9 - 36 V DC	9 - 36 V DC
Power consumption	Typ. 40 W (Max. 55 W)	Typ. 40 W (Max. 55 W)
Environmental		
Operating temperature	-10 to 50 °C	-10 to 50 °C
Storage temperature	-20 to 80 °C	-20 to 80 °C
Humidity	5 to 95 % RH non-condensing at 50 °C	5 to 95 % RH non-condensing at 50 °C
IP rating	IP20	IP20
Shock & Vibration	Vibration sweep sinus (EN 60068-2-6:2008) Vibration random (EN 60721-3-2: 1997 - Class 2M2) Shock (EN 60068-2-27:2009) MIL-STD-810D	Vibration sweep sinus (EN 60068-2-6:2008) Vibration random (EN 60721-3-2: 1997 - Class 2M2) Shock (EN 60068-2-27:2009) MIL-STD-810D
Physical		
Dimensions	265 x 150 x 75 mm	265 x 150 x 75 mm
Weight	2.1 kg	2.1 kg

4.5.2. SIRIUS-SBOXe: Front side

SIRIUS-SBOXe: Connectors at the front side

Name	Description
USB 3.0	4 x USB 3.0 connector
LAN	1x LAN Ethernet (GLAN or 2.5GLAN), RJ45 connector
SSD	Removable Solid State Disk
PWR LED light	Green when Power is available and switch on
PWR switch	Power On rocker switch

4.5.3. SIRIUS-SBOXe: Rear side

SIRIUS-SBOXe: Connectors at the rear side

Name	Description
POWER 9-36V	3-pin LEMO male connector
POWER OUT	2-pin LEMO female connector
GPS	Connection for external GPS display, PPS, Remote ON
LAN	1x LAN Ethernet (GLAN or 2.5GLAN), RJ45 connector
USB 2.0	2 x USB 2.0 connector
WLAN	RP-SMA Female WLAN antenna: WiFi 802.11 b/g/n
GPS ANT	SMA Female GPS antenna
DVI	DVI video out (VGA and HDMI compatible)
EtherCAT	8-pin LEMO female connector
SYNC	4-pin LEMO female sync connector

4.5.4. SIRIUS-SBOXfe: Front side

The SIRIUS-SBOXfe version is an SBOX with EtherCAT® interface. It is available for the Modular Solution. It includes the Intel® Core™ i7 high speed CPU which is the most powerful processor of the Intel® Core™ processor family for fanless operation.

SIRIUS-SBOXfe Front side

Name	Description
PWR LED light	Green when Power is available and switch on
PWR switch	Power On rocker switch
SSD	Removable Solid State Disk
LAN	1x GLAN Ethernet, RJ45 connector
USB 3.0	4x USB 3.0 connector

4.5.5. SIRIUS-SBOXfe: Rear side

SIRIUS-SBOXfe Rear side

Name	Description
SYNC	4-pin LEMO female sync connector
EtherCAT	8-pin LEMO female connector
DVI-D	DVI video out (VGA and HDMI compatible)
GPS ANT	SMA Female GPS antenna
WLAN	RP-SMA Female WLAN antenna: WiFi 802.11 b/g/n
USB 2.0	2x USB 2.0
LAN	1x GLAN Ethernet, RJ45 connector
GPS	Connection for external GPS display, PPS, Remote ON
POWER OUT	2-pin LEMO female connector
GND	M4 grounding insert
POWER 9-36V	3-pin LEMO male connector

4.6. SIRIUS-SBOXwe

Extremely rugged data logger and powerful data processing computer with IP67 degree of protection and wide temperature rating of -40 °C to +50 °C. SBOX waterproof is a perfect companion to the SIRIUS waterproof data acquisition systems.

4.6.1. SIRIUS-SBOXwe: Specifications

Computer	
Processor	Intel® Core™ i7 2x 1.7 GHz base, 3.3 GHz max 4 threads
Memory	8 GB (optional up to 16 GB)
Storage	250 GB mSATA SSD
Interfaces and options	
USB	5x USB 2.0 (Push-Pull)
Ethernet	2x GLAN (Push-Pull), 1x WLAN (RP-SMA Female Jack)
EtherCAT®	1x EtherCAT® 100 Mbps Full Duplex, 8-pin LEMO female
Video	DVI-D
Synchronisation	1x SIRIUS® SYNC
GPS (option)	10 Hz or 100 Hz or 100 Hz + RTK
GPS display (option)	External on DSUB-9 connector with remote power on
Power out	Switched input supply on 2-pin LEMO female (max. 8 A)
Power	
Power supply	9 - 36 V DC
Power consumption	Typ. 18 W
Environmental	
Operating Temperature	-40 to 50°C
Storage temperature	-40 to 80 °C
Humidity	5 to 100 % RH
IP rating	IP65 / IP67
Shock	Shock: SIST EN 60068-2-27:2009 50 g, 6 ms, half-sine 100 g, 4 ms, half-sine 50x pos./neg in each axis 600x total
Vibration	Random: Profile breakpoints: 24 Hz - 0.023 g²/Hz 60 Hz - 0.28 g²/Hz 100 Hz - 0.28 g²/Hz 240 Hz - 0.056 g²/Hz 2 kHz - 0.056 g²/Hz Profile RMS / Peak = 11.5 g / 34.5 g (up to 15 / 45 g with absorbers) 6 hrs in each axis, 18 hrs total
Physical	
Dimensions	282 x 135 x 70 mm
Weight	2.55 kg

4.6.2. SIRIUS-SBOXwe: Front side

SIRIUS-SBOXwe Front side

Name	Description
PWR LED light	Green when Power is available and switch on
PWR switch	Power On rocker switch
GPS	Connection for external GPS display, PPS, Remote ON
ETH	1x GLAN Ethernet, RJ45 connector, Watertight push-pull
USB 2.0	3x USB 2.0 connector, Watertight push-pull

4.6.3. SIRIUS-SBOXwe: Rear side
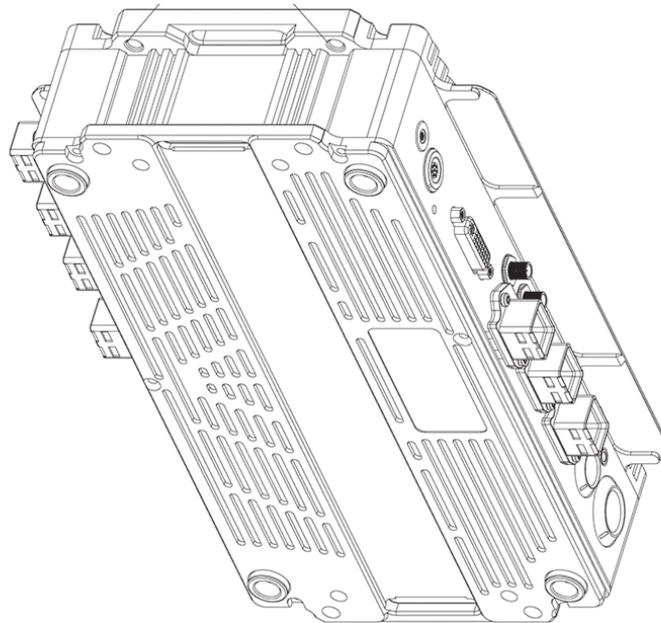
SIRIUS-SBOXwe Rear side

Name	Description
SYNC	4-pin LEMO female sync connector
EtherCAT	8-pin LEMO female connector
DVI-D	DVI video out (VGA and HDMI compatible)
GPS ANT	SMA Female GPS antenna
WLAN	RP-SMA Female WLAN antenna: WiFi 802.11 a/b/g/n/c
USB 2.0	2x USB 2.0, Watertight push-pull
LAN	1x GLAN Ethernet, RJ45 connector, Watertight push-pull
POWER OUT	2-pin LEMO female connector, K-type
GND	Protective ground
POWER	3-pin LEMO male connector, K-type

Power IN connector (on the SBOX): HGL.2K.303.CLAPV
Mating connector (for the cable): FGL.2K.303.CLLC65Z

Power OUT connector (on the SBOX): HGG.1K.302.CLLSV
Mating connector (for the cable): FGG.1K.302.CLAC65Z

4.7. SIRIUS-Waterproof

4.7.1. SIRIUSiwe: Front side

SIRIUSiwe front side

Name	Description
PWR LED light	Green when Power is available and switch on
CNT	2x counter connector (7-pin LEMO female)
STGM or LV	8x STGM or LV connectors (DSUB-9)

4.7.2. SIRIUSiwe: Rear side
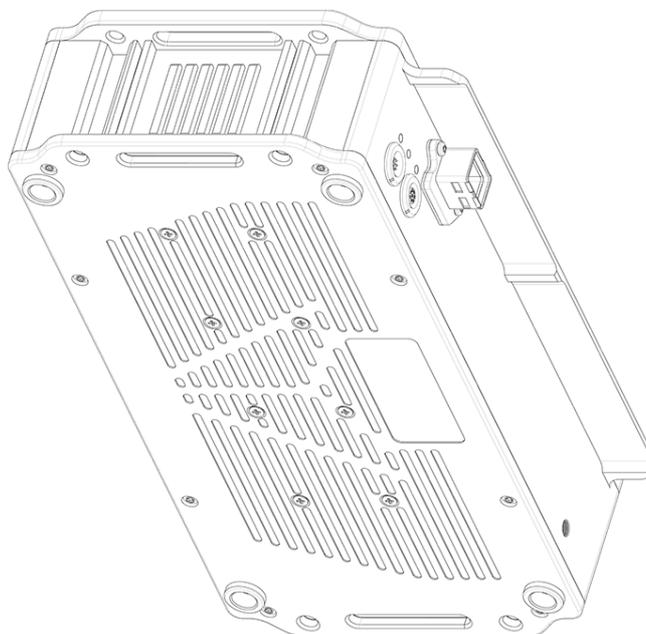
SIRIUSiwe Rear side

Name	Description
EtherCAT IN	EtherCAT® port 8-pin LEMO male connector
EtherCAT OUT	EtherCAT® port 8-pin LEMO female connector
USB	USB 2.0 B-type connector, Watertight push-pull
GND	M4 insert, Protective ground

4.8. SIRIUS-R1DB/R2DB Mobile Data Acquisition System

Compact, mobile data acquisition systems with a built-in data logger, powerful data processing computer, multi-touch display, and internal batteries for maximum portability.

SIRIUS-R2DB

Main Features

- **HIGH-END SIGNAL CONDITIONING**: R1DB/R2DB data acquisition system is built around SIRIUS DAQ technology and features the same versatile and powerful amplifiers for world-leading signal conditioning. See the SIRIUS product page for a detailed SIRIUS DAQ technology overview.
- **ALL-IN-ONE INSTRUMENT**: R1DB/R2DB instruments are stand-alone DAQ systems with the built-in touchscreen LED display, powerful data processing computer, SSD data logging capabilities, and internal Li-Ion batteries (R1DB/R2DB). A version without battery is also available (R2D).
- **UP TO 32 ANALOG INPUTS**: Systems can be configured with one (R1DB) or two (R2DB) SIRIUS DAQ slices for a total of 32 analog inputs capable of connecting virtually any sensor.
- **UP TO 16 COUNTER/ENCODER INPUTS**: Up to 16 counter/encoder or 48 digital input channels, all equipped with our patented SUPERCOUNTER® technology.
- **UP TO 2 ISOLATED CAN PORTS**: Up to 2 high speed CAN 2.0b channels with 1 Mbit/sec data throughput with additional support for CCP, OBDII, J1939, and CAN output.
- **ETHERCAT PORT**: DAQ system includes EtherCAT master port with built-in synchronization for easy connection and extension of any of our EtherCAT based DAQ systems like KRYPTON DAQ modules.
- **ALL INTERFACES**: Interfaces for Wireless LAN, dual GLAN, 4x USB 3.0, GPS, HDMI, 2x synchronization are available.

- **100 Hz GPS WITH RTK**: Optional 10Hz or 100Hz GPS receiver with additional RTK support can be built right into R1DB/R2DB DAQ system.

R1DB is a smaller, even more compact version of R2DB data acquisition system. It features the same multi-touch LED screen, powerful data processing computer, and SSD data logger with internal hot-swappable batteries for maximum portability.

R1DB can accommodate one SIRIUS DAQ slice. Up to 16 analog inputs, 8 counter/encoder inputs, 24 digital inputs, and 1 high speed CAN input.

SIRIUS-R1DB

4.8.1. SIRIUS-SBOXse: Specifications

Computer	
Processor	Intel® Core™ i3; 2x 2.3 GHz base; 4 threads
Memory	8 GB (optional up to 32 GB)
Storage	Non-removable M2 500GB (1 TB as option)
Interfaces and options	
USB Front	4x USB 3.0
Ethernet	2x GLAN (RJ45) 2x front, 1x WLAN (RP-SMA Female Jack)
EtherCAT®	1x EtherCAT® 100 Mbps Full Duplex, 8-pin LEMO female
Synchronisation	2x SIRIUS® SYNC
Video	1x HDMI
GPS (option)	10 Hz or 100 Hz or 100 Hz + RTK
GPS display (option)	External on DSUB-9 female connector + remote power on
Physical	
Weight	0.76 kg

4.8.2. SIRIUS-R1DB: Specifications

Display	
Type	TFT 12.1''
Resolution	WXGA, 1280 x 800 pixels @ 60Hz
Active display Area	261.1 x 163.2 mm
Luminance	1200 cd/m²
Contrast Ratio	1000:1 (typ.)
Viewing Angle (CR>=10)	-89 ~ +89 (H); -89 ~ +89 (V)
Synchronization Range Horizontal / Vertical	30 ~ 83 kHz / 45 ~ 75Hz
Batteries	
Battery type	RRC2040-2
Number of batteries	2, hot swappable
Voltage	11.25 V (at fully charged state 13.05 V)
Total capacity of single battery	6.4 Ah
Discharge current of single battery	6.5 A
Wrong polarity protection	YES
Weight of single battery	0.34 kg
Power	
Power Supply	9 - 36 V DC
Power Consumption	Display: 10 W Computer: 20 W
Power out	
Type	Switched input supply on 2-pin LEMO female
Maximum power	40 W
Output Voltage	11 - 13 V without external supply, 24 V with external supply
EtherCAT® Power out	
Type	Switched input supply on EtherCAT® connector, 8-pin LEMO female
Maximum power	40 W
Output Voltage	11 - 13 V without external supply, 24 V with external supply
Environmental	
Operating Temperature	0 to 40 °C
Storage Temperature	-20 to 60 °C
Humidity	5 to 95 % RH non condensing @ 40 °C
IP rating	IP20
Shock & Vibration	Vibration sweep sinus (EN 60068-2-6:2008) Vibration random (EN 60721-3-2: 1997 - Class 2M2) Shock (EN 60068-2-27:2009) MIL-STD-810D
Physical	
Dimensions	331 x 224 x 145 mm
Weight	6.4 kg (excl. SIRIUS® slices) 8.0 kg (std. system, with batteries)

Hint

A version without display is also available (R1B). All-In-One instrument for one SIRIUSr slice, SBOXse and two hot swappable batteries with integrated Battery Management System.

SIRIUS-R1B

4.8.3. SIRIUS-R2DB: Specifications

Display	
Type	TFT 12.1''
Resolution	WXGA, 1280 x 800 pixels @ 60Hz
Active display Area	261.1 x 163.2 mm
Luminance	1200 cd/m²
Contrast Ratio	1000:1 (typ.)
Viewing Angle (CR>=10)	-89 ~ +89 (H); -89 ~ +89 (V)
Synchronization Range Horizontal / Vertical	30 ~ 83 kHz / 45 ~ 75Hz
Batteries	
Battery type	NL2024HD
Number of batteries	2, hot swappable
Voltage	14.4 V (at fully charged state 16.8 V)
Total capacity of single battery	6.25 Ah
Discharge current of single battery	8 A
Wrong polarity protection	YES
Weight of single battery	0.65 kg
Power	
Power Supply	9 - 36 V DC
Charging power	55 - 65 W total
Power Consumption	Display: 10 W

	Computer: 20 W
Power out	
Type	Switched input supply on 2-pin LEMO female
Maximum power	60 W
Output Voltage	13 - 16 V without external supply, 24 V with external supply
EtherCAT® Power out	
Type	Switched input supply on EtherCAT® connector, 8-pin LEMO female
Maximum power	40 W
Output Voltage	13 - 16 V without external supply, 24 V with external supply
Environmental	
Operating Temperature	0 to 40°C
Storage Temperature	-20 to 60°C
Humidity	5 to 95 % RH non-condensing at 40 °C
IP rating	IP20
Shock & Vibration	Vibration sweep sinus (EN 60068-2-6:2008)\ Vibration random (EN 60721-3-2: 1997 - Class 2M2) Shock (EN 60068-2-27:2009) MIL-STD-810D
Physical	
Dimensions	332 x 225 x 194 mm
Weight	7.8 kg (excl. SIRIUS® slices) 11 kg (std. system, with batteries)

Hint

A version without battery is also available (R2D). The specifications of SIRIUS-R2D are identical to SIRIUS-R2DB, except that SIRIUS-R2D does not have an integrated BMS (Battery Management System).

4.8.4. SIRIUS SBOXse R1DB/R2DB: Front side

SIRIUS-R1DB / R2DB Front side

On the front side of the SIRIUS-R1DB/R2DB you can find these connectors:

Name	Description
ETH	2x Ethernet 1Gbps, RJ45 connector
HDMI	HDMI Video Output
SYNC	2x 4-pin LEMO female sync connectors
USB 3.0	4x USB 3.0
GPS	GPS output connector
WiFi	RP-SMA Female WLAN antenna: WiFi 802.11 b/g/n
GPS ANT	SMA Female GPS antenna
EtherCAT	8-pin LEMO female EtherCAT® connector
PWR switch	To switch the SBOX on/off.
PWR-IN	3-pin LEMO male
Power OUT	2-pin LEMO female

4.9. SIRIUS-R3

R3 is a rack mountable DAQ system built into standard PC computer chassis and integrated SIRIUS data acquisition slices. Ready for simple and inexpensive upgrade of PC components.

R3 can be easily mounted into a 19-inch rack cabinet. The aluminium chassis includes handles with screws or an easy slide-in mechanism.

SIRIUS-R3

Main features:

- HIGH-END SIGNAL CONDITIONING: R3 data acquisition system is built around SIRIUS DAQ technology and features the same versatile and powerful amplifiers for world-leading signal conditioning.
- UP TO 48 ANALOG INPUTS: R3 can be configured with up to three SIRIUS DAQ slices for a total of 32 analog inputs for virtually any sensor.
- UP TO 24 COUNTER/ENCODER INPUTS: Up to 16 counter/encoder or 48 digital input channels, all equipped with our patented SUPERCOUNTER technology.
- UP TO 3 ISOLATED CAN PORTS: Up to 3 high speed CAN 2.0b channels with 1 Mbit/sec data throughput with additional support for CCP, OBDII, J1939, and CAN output.
- HIGH-PERFORMANCE COMPUTER: PC computer inside is built with standard off the shelf computer components which allows easy upgrade of hard-drive, memory, CPU, and other components.
- 19'' RACK MOUNTABLE: The included PC chassis can be mounted in any 19'' rack cabinet.
- SENSOR POWER SUPPLY: Each channel provides power for sensor excitation.
- DIGITAL/COUNTER/ENCODER INPUTS: Each channel is capable of 3x digital inputs, 1x event counter, encoder, period, pulse-width, duty-cycle. Precise frequency and angle measurement use patented SUPERCOUNTER® technology.
- FULLY SYNCHRONIZED: Each channel, either analog, digital or CAN is synchronized with microsecond accuracy.
- SOFTWARE INCLUDED WITH FREE LIFETIME UPGRADES: Easy to use and rich in functionality, our award-winning Dewesoft X software is included with every R3 instrument. Dewesoft X is not only the best DAQ software but also offers lifetime FREE software upgrades.

4.9.1. SIRIUS-R3: Specifications

Computer	
Processor	Intel® Core™ i7-8700; 6 cores, 12 threads; 3.2 GHz base, 4.6 GHz max
Memory	8 GB (optional up to 128 GB)
Storage	2x 500 GB removable SATA SSD Option: 1 TB removable SATA SSD
Motherboard	ATX Form Factor; 30.5 cm x 24.5 cm Intel® Z390 Express Chipset
Interfaces and options	
USB Back	1x USB Type-C™, 2x USB 3.1 Gen 2, 3x USB 3.1 Gen 1, 4x USB 2.0/1.1
USB Front	2x USB 3.1 Gen 1
Ethernet	1x GLAN (RJ-45)
Synchronisation	2x SIRIUS® SYNC on back
Video	1x HDMI
Audio	5x audio jacks, 1x optical S/PDIF Out
DS-IRIG-CLOCK	option, BNC input on back
Power	
Power supply	115 - 230 VACrms, 50 - 60 Hz
Power consumption	Max. 350 W
Environmental	
Operating Temperature	0 to 50°C
Storage Temperature	-20 to 75°C
Humidity	10 - 90 % RH non condensing
IP rating	IP20
Shock & Vibration	Vibration random (EN 60721-3-2: 1997 - Class 2M2)
Physical	
Dimensions	544 x 483 x 177 mm
Weight	16.2 kg (excl. SIRIUS® slices)

4.9.2. SIRIUS-R3: Front side

SIRIUS-R3 front side (with 3 SIRIUSr-8xLV)

Name	Description
USB 3.0	2x USB 3.0
PWR switch	To switch PC on or off.
DISK 1 / 2	2x removable SATA SSD
DVD-RW	Optical disc drive

4.10. SIRIUS-R2/R4

R2/R4 is a compact data acquisition system with up to 64 analog inputs, 32 counter inputs and 32 analog outputs with built-in high-performance, highly reliable data processing computer and SSD data logger.

SIRIUS-R4

Main features

- **HIGH-END SIGNAL CONDITIONING**: R2/R4 data acquisition systems are built around SIRIUS DAQ technology and feature the same versatile and powerful amplifiers for world-leading signal conditioning. Visit SIRIUS product page for detailed SIRIUS DAQ technology overview.
- **POWERFUL AND RELIABLE COMPUTER**: R2/R4 DAQ system offers powerful built-in data processing computer and fast and reliable SSD data logging capabilities for a stand-alone operation.
- **UP TO 64 ANALOG INPUTS**: System can be configured with up to 4 SIRIUS DAQ slices for a total of 64 analog inputs for connecting virtually any sensor.
- **UP TO 32 COUNTER/ENCODER INPUTS**: System can hold up to 32 counter/encoder inputs or 96 digital input channels, all equipped with our patented SUPERCOUNTER® technology.
- **UP TO 4 ISOLATED CAN PORTS**: Configure up to 4 high speed CAN 2.0b channels with 1 Mbit/sec data throughput with additional support for CCP, OBDII, J1939, and CAN output.
- **ETHERCAT MASTER PORT**: R2/R4 DAQ systems include EtherCAT master port with built-in synchronization for easy connection and extension of any of our EtherCAT based DAQ systems like KRYPTON DAQ modules or SIRIUS DAQ system.
- **ALL INTERFACES**: Interfaces for Wireless LAN, dual GLAN, 4x USB 3.0, GPS, HDMI, 2x synchronization are available.
- **100 Hz GPS WITH RTK**: Optional 10Hz or 100Hz GPS receiver with additional RTK support can be built straight into R2/R4 DAQ system.

4.10.1. SIRIUS-R2: Specifications

Computer	
Processor	Intel® Core™ i7; 2x 2.6 GHz base, 3.4 GHz max; 4 threads
Memory	8 GB (optional up to 32 GB)
Storage	Non-removable M2 250 GB (500 GB, 1 TB, 2 TB as option)
Interfaces and options	
USB Front	4x USB 3.0
Ethernet	2x GLAN (RJ45, Option: L1T) 2x front, 1x WLAN (RP-SMA Female Jack)
EtherCAT®	1x EtherCAT® 100 Mbps Full Duplex, 8-pin LEMO female
Synchronisation	2x SIRIUS® SYNC
Video	1x HDMI
GPS (option)	10 Hz or 100 Hz or 100 Hz + RTK
GPS display (option)	External on DSUB-9 female connector + remote power on
Power	
Power supply	9 - 36 V DC
Power consumption	Typ. 30 W (Max. 35 W) (excl. SIRIUS® slices)
Power out & EtherCAT® Power out	
Type	Switched input supply on 2-pin LEMO female & EtherCAT® connector, 8-pin LEMO female
Maximum power	60 W (combined Power out & EtherCAT® Power out)
Output Voltage	12 - 36 V DC
Environmental	
Operating Temperature	-10 to 50 °C
Storage Temperature	-40 to 85 °C
Humidity	95 % RH non condensing @ 50 °C
IP rating	IP20
Shock & Vibration	Vibration sweep sinus (EN 60068-2-6:2008)\ Vibration random (EN 60721-3-2: 1997 - Class 2M2) Shock (EN 60068-2-27:2009) MIL-STD-810D
Physical	
Dimensions	276 x 172 x 142 mm
Weight	2.34 kg (excl. SIRIUS® slices)

4.10.2. SIRIUS-R2-HUB: Specifications

Interfaces and options	
USB Front	1x USB 2.0, USB Mini B
Synchronisation	2x SIRIUS® SYNC
USB 2.0 hub	
Bandwidth	Minimum 20 MB/sec Typical 25 MB/sec Maximum 28 MB/sec
SIRIUS Dual Core	32 AI Channels at 200 kS/sec @ 25.6 MB/sec
SIRIUS HS	32 AI Channels, 450 kS/sec @ 28.8 MB/sec 8 AI Channels + 1 Counter, 1000 kS/sec @ 20 MB/sec
Power	
Power supply	9 - 36 V DC
Connector	3-pin LEMO male
Power consumption	Typ. 4.8 W (Max. 6.8 W) (excl. SIRIUS® slices)
Environmental	
Operating Temperature	-10 to 50 °C
Storage Temperature	-40 to 85 °C
Humidity	95 % RH non condensing @ 50 °C
IP rating	IP20
Shock & Vibration	Vibration sweep sinus (EN 60068-2-6:2008)\ Vibration random (EN 60721-3-2: 1997 - Class 2M2) Shock (EN 60068-2-27:2009) MIL-STD-810D
Physical	
Dimensions	276 x 172 x 142 mm
Weight	2.77 kg (excl. SIRIUS® slices)

4.10.3. SIRIUS-R4: Specification

Computer	
Processor	Intel® Core™ i7; 2x 2.6 GHz base, 3.4 GHz max; 4 threads
Memory	8 GB (optional up to 32 GB)
Storage	Non-removable M2 250 GB (500 GB, 1 TB as option)
Interfaces and options	
USB Front	4x USB 3.0
Ethernet	2x GLAN (RJ45, Option: L1T) 2x front, 1x WLAN (RP-SMA Female Jack)
EtherCAT®	1x EtherCAT® 100 Mbps Full Duplex, 8-pin LEMO female
Synchronisation	2x SIRIUS® SYNC
Video	1x HDMI
GPS (option)	10 Hz or 100 Hz or 100 Hz + RTK
GPS display (option)	External on DSUB-9 female connector + remote power on
Power	
Power supply	9 - 36 V DC
Power consumption	Typ. 30 W (Max. 35 W) (excl. SIRIUS® slices)
Power out & EtherCAT® Power out	
Type	Switched input supply on 2-pin LEMO female & EtherCAT® connector, 8-pin LEMO female
Maximum power	60 W (combined Power out & EtherCAT® Power out)
Output Voltage	12 - 36 V DC
Environmental	
Operating Temperature	-10 to 50°C
Storage Temperature	-40 to 85°C
Humidity	95 % RH non condensing @ 50 °C
IP rating	IP20
Shock & Vibration	Vibration sweep sinus (EN 60068-2-6:2008)\ Vibration random (EN 60721-3-2: 1997 - Class 2M2) Shock (EN 60068-2-27:2009) MIL-STD-810D
Physical	
Dimensions	276 x 251 x 150 mm
Weight	3.2 kg (excl. SIRIUS® slices)

4.10.4. SIRIUS-R4-HUB: Specification

Interfaces and options	
USB Front	1x USB 2.0, USB Mini B
Synchronisation	2x SIRIUS® SYNC
USB 2.0 hub	
Bandwidth	Minimum 20 MB/sec Typical 25 MB/sec Maximum 28 MB/sec
SIRIUS Dual Core	32 AI Channels at 200 kS/sec @ 25.6 MB/sec
SIRIUS HS	32 AI Channels, 450 kS/sec @ 28.8 MB/sec 8 AI Channels + 1 Counter, 1000 kS/sec @ 20 MB/sec
Power	
Power supply	9 - 36 V DC
Connector	3-pin LEMO male
Power consumption	Typ. 4.8 W (Max. 6.8 W) (excl. SIRIUS® slices)
Environmental	
Operating Temperature	-10 to 50°C
Storage Temperature	-40 to 85°C
Humidity	95 % RH non condensing @ 50°C
IP rating	IP20
Shock & Vibration	Vibration sweep sinus (EN 60068-2-6:2008)\ Vibration random (EN 60721-3-2: 1997 - Class 2M2) Shock (EN 60068-2-27:2009) MIL-STD-810D
Physical	
Dimensions	276 x 251 x 150 mm
Weight	2.75 kg (excl. SIRIUS® slices)

4.10.5. SIRIUS-R2/R4: Front side

SIRIUS-R4 Front side (SBOX R4)

On the front side of the SIRIUS-R4 or SBOXse you can find these connectors:

Name	Description
LAN	2x Ethernet 1 Gbps, RJ45 connector
Wi-Fi	RP-SMA Female WLAN antenna: WiFi 802.11 b/g/n
HDMI	HDMI Video out
GPS ANT	SMA Female GPS antenna
EtherCAT	8-pin LEMO female connector
PWR	To switch the SBOX on or off.
GPS	DSUB-9 female GPS connector
OUT	Power out 2-pin LEMO female connector
SYNC	2x 4-pin LEMO male sync connector
IN	Power in 3-pin LEMO male connector
USB 3.0	4x USB 3.0

4.10.6. SIRIUS-R2/R4: Rear side

SIRIUS-R4rt rear side

On the back side of the SIRIUS-R4 you can find these connectors:

Name	Description
AO 1 to 8	Analog out BNC connectors (optional)
EtherCAT IN	EtherCAT® slave port (optional) 8-pin LEMO male connector
EtherCAT OUT	EtherCAT® slave port (optional) 8-pin LEMO female connector

Important
See chapter "EtherCAT® slave port" for details.

4.10.7. SIRIUS-R2-HUB/R4-HUB: Front side

SIRIUS-R4-HUB

Name	Description
SYNC	2x 4-pin LEMO male sync connector
GND	Protective Ground banana plug and screw connector
USB	USB 2.0, USB Mini B
PWR	To switch the System on/off.
IN	Power in 3-pin LEMO male connector

4.11. SIRIUS-R8 SYSTEMS

High channel count data acquisition system with built-in data logger and powerful data processing computer, touch screen display (R8D) and internal batteries (R8B, R8DB) for maximum portability.

SIRIUS-R8DB

Main Features:

- HIGH-END SIGNAL CONDITIONING: R8 data acquisition systems are built around SIRIUS DAQ technology and feature the same versatile and powerful amplifiers for world-leading signal conditioning. Visit SIRIUS product page for detailed SIRIUS DAQ technology overview.
- ALL-IN-ONE INSTRUMENT: R8 instruments are high channel count, standalone DAQ systems with built-in powerful data processing computer, SSD data logging capabilities, touch-screen LED display (R8D and R8DB), and internal Li-Ion batteries (R8B/R8DB) for maximum portability.
- UP TO 128 ANALOG INPUTS: Systems can be configured with up to eight SIRIUS DAQ slices for a total of 128 analog inputs for virtually any sensor.
- UP TO 64 COUNTER/ENCODER INPUTS: R8 DAQ system can be configured with up to 64 counter/encoder or 192 digital input channels, all equipped with our patented SUPERCOUNTER® technology.
- UP TO 8 ISOLATED CAN PORTS: Configure up to 8 high speed CAN 2.0b channels with 1 Mbit/sec data throughput with additional support for CCP, OBDII, J1939, and CAN output.
- UP TO 64 ANALOG OUTPUTS: R8/R8B can be configured with up to 64 analog outputs and can function as a multi-channel function generator, analog replay, or control device with the output voltage signal of ±10V.
- ETHERCAT MASTER PORT: R8 DAQ systems include an EtherCAT master port with built-in synchronization for easy connection and extension of any of our EtherCAT based DAQ system like KRYPTON DAQ modules or SIRIUS DAQ system.
- ALL INTERFACES: Interfaces for Wireless LAN, dual GLAN or 2.5GLAN (depending on SBOX version), 4x USB 3.0, GPS, HDMI, 2x synchronization are available.
- 100 Hz GPS WITH RTK: Optional 10 Hz or 100 Hz GPS receiver with additional RTK support can be built straight into R1DB/R2DB DAQ system.

Hint

The analog out option is available only on SIRIUS-R8B and SIRIUS-R8.

4.11.1. SIRIUS-SBOXre

At the heart of every R8 DAQ system is a powerful SBOX computer powered by Intel CPU. Together with variable memory, fast internal SSD storage, and a removable data SSD hard drive it provides enough storage and power for processing data from thousands of channels. Please check the specifications tables below for more information about the computer specifications The R8 SBOX computer is also equipped with all the modern interfaces for connectivity and expansion:

- Network interfaces: 2x GLAN or 2x 2.5GLAN, optionally with WLAN instead of one GLAN or 2.5GLAN ports (depending on SBOX version).
- USB 3.0: 4x USB 3.0 ports for data acquisition devices like SIRIUS, DEWE-43A, and peripherals like mouse, keyboard, printers and external hard drives.
- EtherCAT master port: for connecting any of our EtherCAT data acquisition devices like KRYPTON or SIRIUS.
- HDMI and VGA video: for connecting an external display.
- GPS receiver: optional built-in 10 Hz or 100 Hz GPS receiver with an option to connect external GPS display.

Hint

There are two different versions - SBOXre and SBOXre-WIFI where the difference is that the SBOXre has two LAN connectors and no WLAN, while SBOXre-WIFI has WLAN and one LAN connector.

	SBOXre v1	SBOXre v2 (see 1)
Computer		
Processor	Intel® Core™ i7; 4x 2.0 GHz base, 2.8 GHz max; 8 threads	Intel® Core™ i5 (I5-1145G7E) - Kontron 36030-0000-15-5 4x 1.5 GHz base, 4.1 GHz max 8 threads
Memory	8 GB (optional up to 32 GB)	8 GB (optional up to 32 GB)
Storage	250 GB removable SATA SSD Option: 4 TB removable SATA SSD Option: 250 GB mSATA internal SSD	500 GB removable SATA SSD Option: up to 4 TB removable SATA SSD Option: up to 1 TB NVMe internal SSD
Interfaces and options		
USB	Front: 4x USB 3.0	Front: 4x USB 3.0
Ethernet	Default: 2x GLAN (RJ45) Option: 1x GLAN (RJ45), 1x WLAN (RP-SMA Female Jack)	Default: 2x 2.5GLAN (RJ45) Option: 1x 2.5GLAN (RJ45), 1x WLAN (RP-SMA Female Jack)
EtherCAT®	1x EtherCAT® 100 Mbps Full Duplex, 8-pin LEMO female, 8 A (shared with power out connector)	1x EtherCAT® 100 Mbps Full Duplex, 8-pin LEMO female
Power out	Switched input supply on 2-pin LEMO female, 8 A (shared with EtherCAT® connector)	Switched input supply on 2-pin LEMO female, 8 A (shared with EtherCAT® connector)
Synchronization	2x SIRIUS® SYNC	2x SIRIUS® SYNC
Video	1x DVI-I (VGA and HDMI compatible)	1x DVI-I (VGA and HDMI compatible)
GPS (option)	10 Hz or 100 Hz or 100 Hz + RTK	10 Hz or 100 Hz or 100 Hz + RTK
GPS display (option)	External on DSUB-9 female connector + remote power on	External on DSUB-9 female connector + remote power on
Power		
Power supply	12 - 36 V DC	12 - 36 V DC
Power consumption	Typ. 25 W (max. 55 W) (excl. SIRIUS® slices)	Typ. 30 W (max. 55 W) (excl. SIRIUS® slices)
Environmental		
Operating Temperature	-10 to 50 °C	-10 to 50 °C
Storage Temperature	-40 to 85 °C	-40 to 85 °C
Humidity	5 to 95 % RH non-condensing at 50 °C	5 to 95 % RH non-condensing at 50 °C
IP rating	IP20	IP20
Shock & Vibration	Vibration sweep sinus (EN 60068-2-6:2008) Vibration random (EN 60721-3-2: 1997 - Class 2M2) Shock (EN 60068-2-27:2009) MIL-STD-810D	Vibration sweep sinus (EN 60068-2-6:2008) Vibration random (EN 60721-3-2: 1997 - Class 2M2) Shock (EN 60068-2-27:2009) MIL-STD-810D
1) Available after Q4 2022		

SBOXre

SBOXre-WIFI

On the front side of the SBOXre you can find these connectors:

Name	Description
LAN	2 Ethernet (SBOXre)or 1 Ethernet and 1 WLAN (SBOXre-WIFI), RJ45 connector
WLAN ANT	RP-SMA Female WLAN antenna: WiFi 802.11 b/g/n (not for SBOXre-2GLAN)
DVI	DVI Video out (VGA and HDMI compatible)
GPS ANT	SMA Female GPS antenna
SSD	Removable Solid State Drive
EtherCAT	8-pin LEMO 1B Series female connector
PWR Led light	Green when Power is available and switched on
PWR switch	To switch the SBOX on/off.
GPS	DSUB-9 female GPS connector
PWR OUT	2-pin LEMO 1B Series female connector
SYNC	2x 4-pin LEMO 00 Series male sync connector
USB 3.0	4x USB 3.0
POWER	Power in 2-pin LEMO 2B Series male connector
GND	Protective Ground banana plug and M4 insert

4.11.2. SIRIUS-R8: Specifications

Computer	
Processor	Intel® Core™ i5 (I5-1145G7E) 4x 1.5 GHz base, 4.1 GHz max 8 threads
Memory	8 GB (optional up to 40 GB)
Storage	500 GB removable SATA SSD Option: up to 4 TB removable SATA SSD Option: up to 1 TB NVMe internal SSD
Interfaces and options	
USB	Front: 4x USB 3.0
Ethernet	Standard: 2x 2.5GLAN (RJ45) Optional: 1x 2.5GLAN (RJ45), 1x WLAN (RP-SMA Female Jack)
EtherCAT®	1x EtherCAT® 100 Mbps Full Duplex, 8-pin LEMO female, 8 A (shared with power out connector)
Power out	Switched input supply on 2-pin LEMO female, 8 A (shared with EtherCAT® connector)
Synchronization	2x SIRIUS® SYNC
Video	1x DVI-I (VGA and HDMI compatible)
GPS (option)	10 Hz or 100 Hz or 100 Hz + RTK
GPS display (option)	External on DSUB-9 female connector + remote power on
Analog out option	up to 64 channels
Power	
Power supply	12 - 36 V DC
Power consumption	Typ. 30 W (Max. 55 W) (excl. SIRIUS® slices)
Environmental	
Operating Temperature	-10 to 50 °C
Storage Temperature	-40 to 85 °C
Humidity	5 to 95 % RH non-condensing at 50 °C
IP rating	IP20
Shock & Vibration	Vibration sweep sinus (EN 60068-2-6:2008) Vibration random (EN 60721-3-2: 1997 - Class 2M2) Shock (EN 60068-2-27:2009) MIL-STD-810D
Physical	
Dimensions	446 x 317 x 148 mm
Weight	7.4 kg (excl. SIRIUS® slices)

4.11.3. SIRIUS-R8rt: Specifications

Computer	
Processor	Intel® Core™ i5 (I5-1145G7E) 4x 1.5 GHz base, 4.1 GHz max 8 threads
Memory	8 GB (optional up to 40 GB)
Storage	500 GB removable SATA SSD Option: up to 4 TB removable SATA SSD Option: up to 1 TB NVMe internal SSD
Interfaces and options	
USB	Front: 4x USB 3.0
Ethernet	Option 1: 1x GLAN (RJ45) or 1x 2.5GLAN (RJ45), 1x WLAN (RP-SMA Female Jack) Option 2: 2x GLAN (RJ45) or 2x 2.5GLAN (RJ45 instead of WLAN
EtherCAT®	1x EtherCAT® 100 Mbps Full Duplex, 8-pin LEMO female, 8 A (shared with power out connector)
Power out	Switched input supply on 2-pin LEMO female, 8 A (shared with EtherCAT® connector)
Synchronization	2x SIRIUS® SYNC
Video	1x DVI-I (VGA and HDMI compatible)
GPS (option)	10 Hz or 100 Hz or 100 Hz + RTK
GPS display (option)	External on DSUB-9 female connector + remote power on
Analog out option	up to 64 channels
EtherCAT® slave port	
Minimum delay (analog input to EtherCAT® bus)	70 µs
Minimum EtherCAT® cycle time	100 µs
Power	
Power supply	12 - 36 V DC
Power consumption	Typ. 30 W (max. 55 W) (excl. SIRIUS® slices)
Environmental	
Operating Temperature	-10 to 50 °C
Storage Temperature	-40 to 85 °C
Humidity	5 to 95 % RH non-condensing at 50 °C
IP rating	IP20
Shock & Vibration	Vibration sweep sinus (EN 60068-2-6:2008) Vibration random (EN 60721-3-2: 1997 - Class 2M2) Shock (EN 60068-2-27:2009) MIL-STD-810D
Computer	
Dimensions	446 x 317 x 148 mm
Weight	7.4 kg (excl. SIRIUS® slices)

4.11.4. SIRIUS-R8DB: Amplifier side

SIRIUS-R8DB, SIRIUS-R8B, SIRIUS-R8D or SIRIUS-R8 Amplifier side

Hint

Connectors on the amplifier side are the connectors from SBOXre and selected modules. For a more detailed description of the connectors please refer to the section "SIRIUS-SBOXre".

4.11.5. SIRIUS-R8: Rear side

SIRIUS-R8 EXT CAL

SIRIUS-R8 Analog Out

SIRIUS-R8rt

Name	Description
EXT CAL	R8 system features (optional) cal reference input. External calibration reference can be connected via a single BNC connector on the rear side of the R8 and can be switched in the software to all input channels at once to check the amplifier performance and accuracy.
AO 1 to 8	8x BNC connectors per slice (optional) Up to 64 analog outputs
EtherCAT IN	EtherCAT® slave port (optional) 8-pin LEMO male connector
EtherCAT OUT	EtherCAT® slave port (optional) 8-pin LEMO female connector

Important
See chapter "EtherCAT® slave port" for details.

4.11.6. SIRIUS-R8DB: Display side

SIRIUS-R8DB or SIRIUS-R8D Display side

Name	Description
USB 3.0	3x USB 3.0
USB 2.0	1x USB 2.0
PWR switch	To switch the SBOX on/off.

4.12. SIRIUSm

Main features:

- SMALLEST DAQ: SIRIUS mini is our smallest, 4-channel data acquisition system, mainly suitable for acoustic, vibration, and angle measurements.
- UNMATCHED PRICE: SIRIUS mini ships off-the-shelf with high-quality signal conditioning and world-leading, award-winning data acquisition software for the best price on the market.
- USB POWERED: SIRIUS mini does not require any external power supply. It can be powered straight from a USB connection, for example, a laptop.
- 4 IEPE/VOLTAGE INPUTS: System is configured with 4 high dynamic analog inputs, dual sigma-delta ADC's with 200 kHz per channel sampling rate and up to 160 dB dynamic range.
- COUNTER/ENCODER/DIGITAL INPUTS: System is configured with one counter/encoder input and is capable of 3x digital inputs, 1x event counter, encoder, period, pulse-width, duty-cycle. Precise frequency and angle measurement use patented SUPERCOUNTER® technology.

SIRIUSm-4xACC

Important

SIRIUSm does not have cooling fans.

4.12.1. SIRIUSm: Specifications

	SIRIUSm-4xACC		SIRIUSm-3xACC-1xACC+	
Analog inputs				
Input type	Voltage IEPE		Voltage IEPE	
ADC type	24-bit delta-sigma dual core with anti-aliasing filter		24-bit delta-sigma dual core with anti-aliasing filter	
Sampling rate	Simultaneous 200 kS/sec		Simultaneous 200 kS/sec	
Ranges (Dual Core Low Range)	**±10 V (±500 mV)**	**±500 mV (NA)**	**±10 V (±500 mV)**	**±500 mV (NA)**
Input Accuracy (Dual Core)	±0.1 % of reading ±10 (1) mV	±0.1 % of reading ±1 (NA) mV	±0.1 % of reading ±10 (1) mV	±0.1 % of reading ±1 (NA) mV
Dynamic Range @ 10 kS (Dual Core)	140 dB (160 dB)	135 dB (NA)	140 dB (160 dB)	135 dB (NA)
Typ. SNR @ 50 kS (Dual Core)	107 dB (125 dB)	100 dB (NA)	107 dB (125 dB)	100 dB (NA)
Typ. CMR @ 50Hz/1kHz	140 / 120 dB	140 / 120 dB	140 / 120 dB	140 / 120 dB
Gain Drift	Typical 10 ppm/K, max. 30 ppm/K		Typical 10 ppm/K, max. 30 ppm/K	
Offset Drift	Typical 0.5 µV/K + 2 ppm of range/K, max 2 µV/K + 10 ppm of range/K		Typical 0.5 µV/K + 2 ppm of range/K, max 2 µV/K + 10 ppm of range/K	
Gain Linearity	<0.02 %		<0.02 %	
Inter Channel Phase-mismatch	0.02° * fin [kHz] + 0.1° (@ 200 kS/sec)		0.02° * fin [kHz] + 0.1° (@ 200 kS/sec)	
Channel Cross talk	>160 dB @ 1 kHz		>160 dB @ 1 kHz	
Input Coupling	DC, AC 0.1 Hz,1 Hz		DC, AC 0.1 Hz,1 Hz	
Input Impedance	1 MΩ (270 kΩ for AC coupling ≥1 Hz)in parallel with 100 pF		1 MΩ (270 kΩ for AC coupling ≥1 Hz)in parallel with 100 pF	
Overvoltage Protection	In+ to In-: 50 V continuous; 200 V peak (10 msec)		In+ to In-: 50 V continuous; 200 V peak (10 msec)	
IEPE mode				
Excitation	2, 4, 8, 12, 16 or 20 mA		2, 4, 8, 12, 16 or 20 mA	
Compliance voltage	25 Volt		25 Volt	
Output Impedance	>100 kΩ		>100 kΩ	
Sensor detection	Shortcut: <4 Volt; Open: >19 Volt		Shortcut: <4 Volt; Open: >19 Volt	
Additional Specifications				
Input connector BNC	BNC		BNC & 7-pin LEMO (L1B7F) for counter input	
TEDS support	IEPE mode only		IEPE mode only	
Digital Inputs				
Inputs	✗		1 counter 3 digital Fully synchronised with analog data	
Counter modes	✗		counting, waveform timing, encoder, tacho, gear-tooth sensor	
Input level compatibility	✗		CMOS, LVTTL	
Input protection	✗		±25 V continuous	

Digital output	X	1 ch open collector, max. 100 mA / 30 V
Power		
Power supply	5.0 V (+0.25 V, -0.6 V) DC	5.0 V (+0.25 V, -0.6 V) DC
Power consumption	Data USB port: Max. 2.5 W Power USB port: Typ. 2.5 W, Max. 6 W	Data USB port: Max. 2.5 W Power USB port: Typ. 2.5 W, Max. 6 W
Environmental		
Operating Temperature	-10 to 50 °C	-10 to 50 °C
Storage Temperature	-40 to 85 °C	-40 to 85 °C
Humidity	5 to 95 % RH non-condensing at 50 °C	5 to 95 % RH non-condensing at 50 °C
IP rating	IP50	IP50
Shock & Vibration	Vibration sweep sinus (EN 60068-2-6:2008) Vibration random (EN 60721-3-2: 1997 - Class 2M2) Shock (EN 60068-2-27:2009) MIL-STD-810D	Vibration sweep sinus (EN 60068-2-6:2008) Vibration random (EN 60721-3-2: 1997 - Class 2M2) Shock (EN 60068-2-27:2009) MIL-STD-810D
Physical		
Dimensions	146 x 139 x 64 mm	146 x 139 x 64 mm
Weight	0.74 kg	0.74 kg

4.13. MINITAURs

This is a mixed signal data acquisition system and multichannel data logger with cutting-edge technology at an attractive price.

Main features:

- ALL-IN-ONE DEVICE: Instrument packs powerful data logger and data acquisition device in one compact chassis. Inside this small instrument lives a powerful Intel Core i3 CPU computer, solid state drive, WiFi, two LAN ports, four USB 3.0 and two USB 2.0 ports, EtherCAT master port, and optional 10 Hz or 100 Hz GPS receiver.
- UNIVERSAL ANALOG INPUTS: Instrument can accept voltage and full/half/quarter bridge signals natively as well as IEPE, charge, thermocouples, RTD, current, resistance and LVDT signals with the use of DSI adapters.
- 160 dB DYNAMIC RANGE: With our DualCoreADC® technology all analog inputs boost dual 24-bit delta-sigma with the anti-aliasing filter, achieving an astonishing 160 dB dynamic range in time and frequency domain.
- SENSOR POWER SUPPLY: Amplifiers provide channel-independent, programmable sensor power supply.
- DIGITAL/COUNTER/ENCODER INPUTS: Each channel is capable of 3x digital inputs, 1x event counter, encoder, period, pulse-width, duty-cycle. Precise frequency and angle measurement use patented SUPERCOUNTER® technology.
- ISOLATED CAN INPUT: High speed CAN 2.0b channels with 1 Mbit/sec data throughput with additional support for CCP, OBDII, J1939, and CAN output.
- FULLY SYNCHRONIZED: Each channel, analog, digital or CAN is synchronized with microsecond accuracy.

4.13.1. MINITAURs: Specifications

Analog inputs	
Inputs	8 ch voltage Full / Half / Quarter bridge strain
ADC type	24-bit delta-sigma DUALCOREADC® with anti-aliasing filter
Sampling rate	Simultaneous 200 kS/sec
DUALCOREADC® Ranges (Low Range)	±10 V (500 mV), ±1 V (50 mV), ±100 mV (5 mV), ±10 mV (0.5 mV)
Bridge ranges @ 10 Vexc (Low Range)	1000 (50) mV/V, 100 (5) mV/V, 10 (0.5) mV/V, 1 (0.05) mV/V
Dynamic Range @ 10 kS (DUALCOREADC®)	137 dB (152 dB)
Input coupling	DC
Input impedance	10 MΩ
Bridge modes	Full / Half / Quarter Br 120 / 350 Ω 3-wire; internal bridge completion
Internal shunt resistor	100 kΩ, bipolar to Exc+ or Exc- (others on request)
TEDS	Standard + DSI adapters
Excitation Voltage	0 to 12 VDC software programmable (16-bit DAC), max 44 mA
Overvoltage protection	In+ to In-: 50 V continuous; 200 V peak (10 msec)
Digital inputs	
Inputs	8 counter 24 digital Fully synchronised with analog data
Input level compatibility	CMOS, LVTTL
Input protection	±25 V continuous
Digital output	8 ch open collector, max. 100 mA / 30 V
CAN bus	
Inputs	1 CAN port
CAN port type	CAN 2.0B full speed, read&write
Computer	
Processor	Intel® Core™ i3 2x 2.1 GHz base 4 threads
Memory	4 GB (up to 16 GB upon request)
Storage	250 GB removable SATA SSD Option: 1 TB removable SATA SSD Option: 250 GB mSATA internal SSD
Interfaces and options	
USB	Front: 4x USB 3.0 Rear: 2x USB 2.0
Ethernet	Front: 1x GLAN (RJ45) Back: 1x GLAN (RJ45), 1x WLAN (RP-SMA Female Jack)
EtherCAT®	1x EtherCAT® 100 Mbps Full Duplex, 8-pin LEMO female
Synchronisation	2x SIRIUS® SYNC

Video	1x DVI-D
GPS (option)	10 Hz or 100 Hz or 100 Hz + RTK
GPS display (option)	External on DSUB-9 female connector + remote power on
Power out	Switched input supply on 2-pin LEMO female (max. 8 A)
Power	
Power supply	9 - 36 V DC
Power consumption	Typ. 35 W (Max. 56 W)
Environmental	
Operating Temperature	-10 to 50 °C
Storage Temperature	-40 to 85 °C
Humidity	5 % to 95 % RH non-condensing at 50 °C
IP rating	IP20
Shock & Vibration	Vibration sweep sinus (EN 60068-2-6:2008) Vibration random (EN 60721-3-2: 1997 - Class 2M2) Shock (EN 60068-2-27:2009) MIL-STD-810D
Physical	
Dimensions	266 x 139 x 109 mm
Weight	3.0 kg

Important

For **Analog inputs** detailed specifications please see chapters: "*STGMv3: Specifications*", "*STGM*" for connection to DSUB-9.

For **Digital inputs** detailed specifications please see chapters: "*STGM+ (Counter)*" and "*General counter specifications*".

4.14. Connections examples

In this chapter it is possible to find some connection examples to give an idea of what combinations of devices are possible and what are the important limitations you need to consider before mounting the Dewesoft system.

4.14.1. Two SIRIUS USB/EtherCAT devices

4.14.1.1. USB

When acquiring data from multiple measurement devices, the degree to which the data of the different channels can be correlated to each other in time can be very important. If the acquired data of the different devices is not synchronised, the analysis may be inaccurate or even completely wrong. The importance of synchronization increases with the speed of data acquisition.

When connecting two SIRIUS USB devices to a PC, an additional synchronisation cable is required.
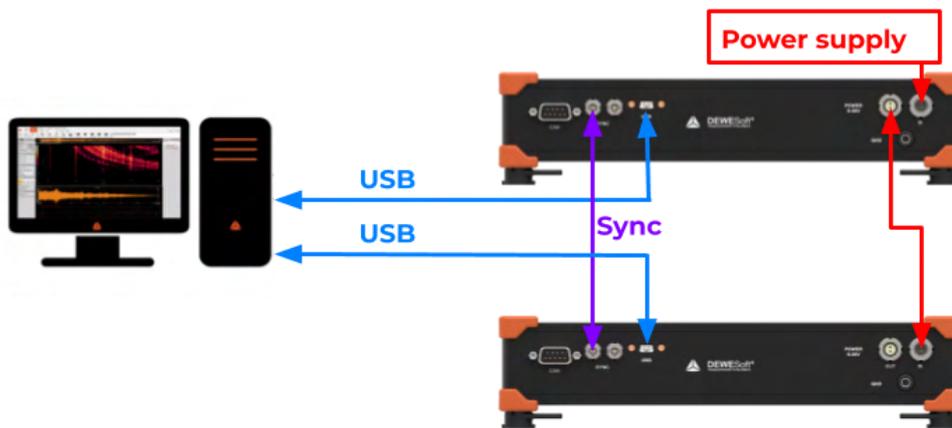
Connecting two SIRIUS USB to PC

List of required cables:

Function	Dewesoft order code
Power supply	PS-120-L1B2f
Supply daisy chain	L1B2m-L1B2f
Synchronization	L00B4m-L00B4m
USB	USB1-USB2s or USB1s-USB2s

4.14.1.2. EtherCAT

When using only DeweSoft EtherCAT devices (KRYPTON, SIRIUSe or IOLITE), the connection is straightforward via ECAT to ECAT cable.

For data transmission, data synchronization, and power supply the EtherCAT protocol with 100 Mb/s bus speed is used. Devices are connected together with a single cable for data, power, and sync.
All data is always perfectly synchronized down to microsecond accuracy, even though each data source can have different sampling rates (software selectable for each channel).

No additional cables are needed, because the synchronization between modules runs through the same EtherCAT cable as power and data. This makes the system more transparent and reduces the chances of wiring errors,...
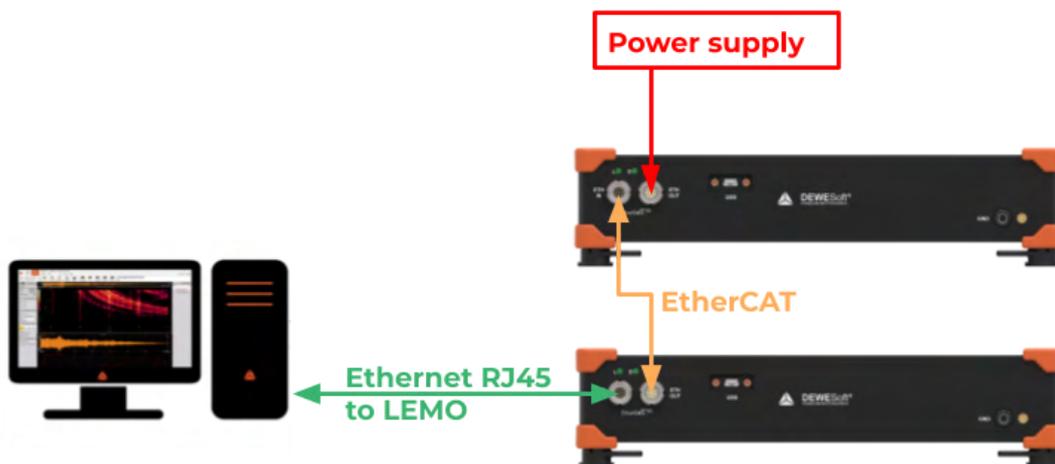
Connecting two SIRIUS EtherCAT to PC

List of required cables:

Function	Dewesoft order code
Power supply	PS-120-L1T8m
Ethercat	EtherCAT to EtherCAT: L1T8m-L1T8f, ECAT - PC connection: L1T8f-RJ45

4.14.2. Combining EtherCAT and USB chain

When using USB SIRIUS devices and EtherCAT devices we need sync junction to synchronize the USB and ECAT data. The sync junction will provide a clock source for synchronization. External timing sources like GPS or IRIG can be connected and used. When we calculate the bandwidth of a system we need to acknowledge that we have two data lines in our system - USB and EtherCAT.
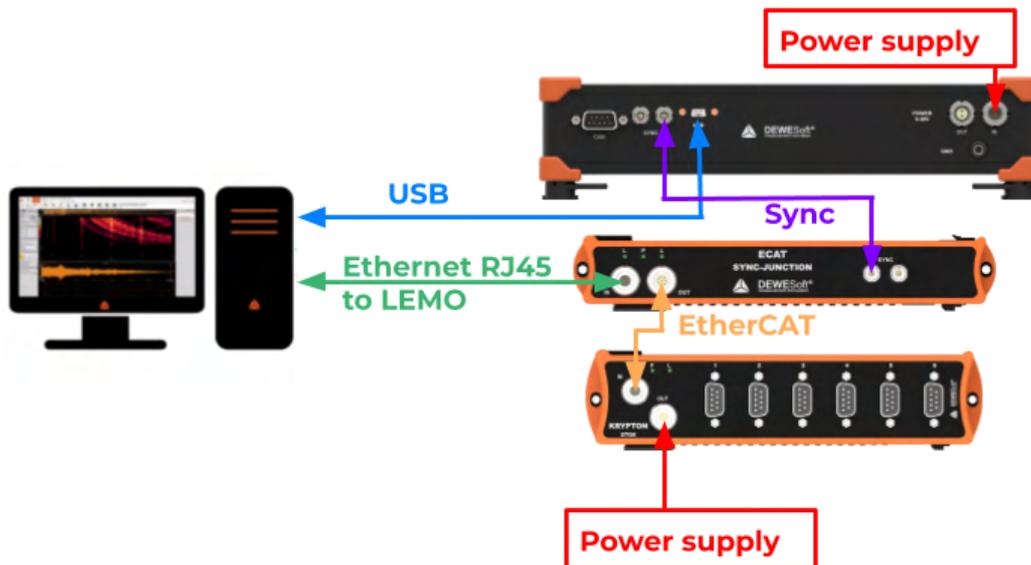
Synchronizing data from USB and ECAT data lines with Sync junction

List of required cables:

Function	Dewesoft order code
Power supply	KRYPTON: PS-120-L1T8m, SIRIUS: PS-120-L1B2f
Ethercat	EtherCAT to EtherCAT: L1T8m-L1T8f, ECAT - PC connection: L1T8f-RJ45
Synchronization	L00B4m-L00B4m
USB	USB1-USB2s or USB1s-USB2s

4.14.2.1. Rack system with EtherCAT

Because the sync junction is already built into the IOLITE, R1DB/R2DB, R4, R8, R2 or MINITAURs DAQ systems, the ECAT sync junction is not required when extending the measurement system with EtherCAT devices.
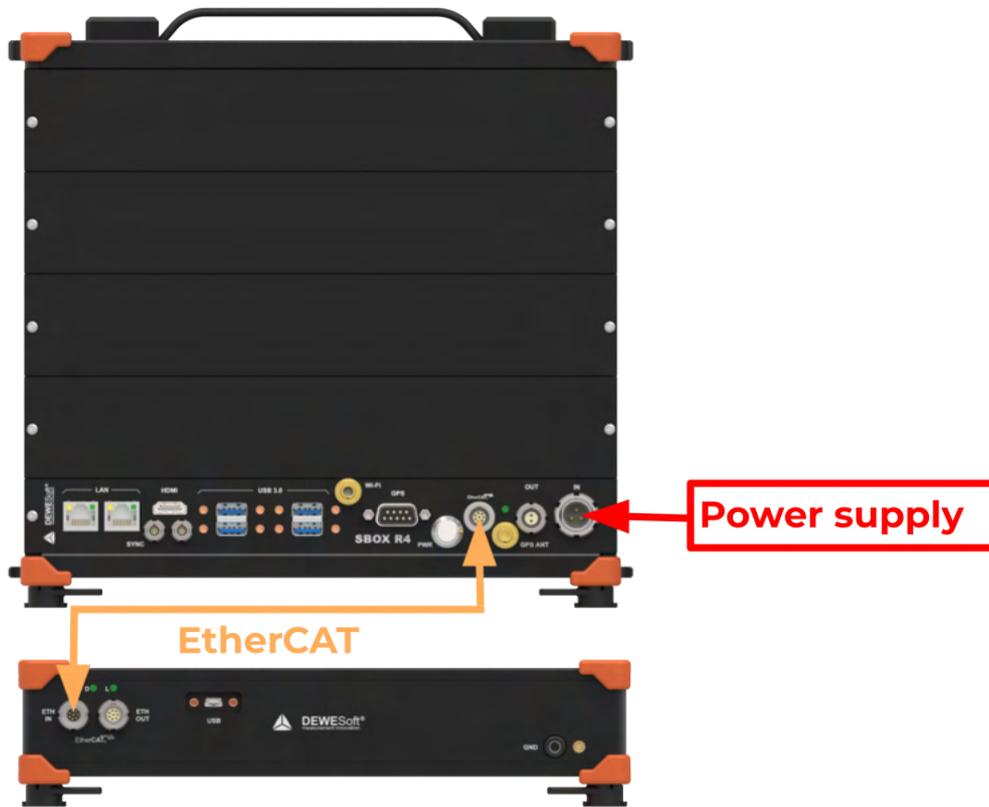
Connection between R4 and SIRIUSe

List of required cables:

Function	Dewesoft order code
Power supply	PS-200-L2T3F
Ethercat	EtherCAT to EtherCAT: L1T8m-L1T8f

4.14.3. Mixed system

If a similar mixed system is being built, take into consideration that IOLITE-s has an internal sync junction for synchronization.
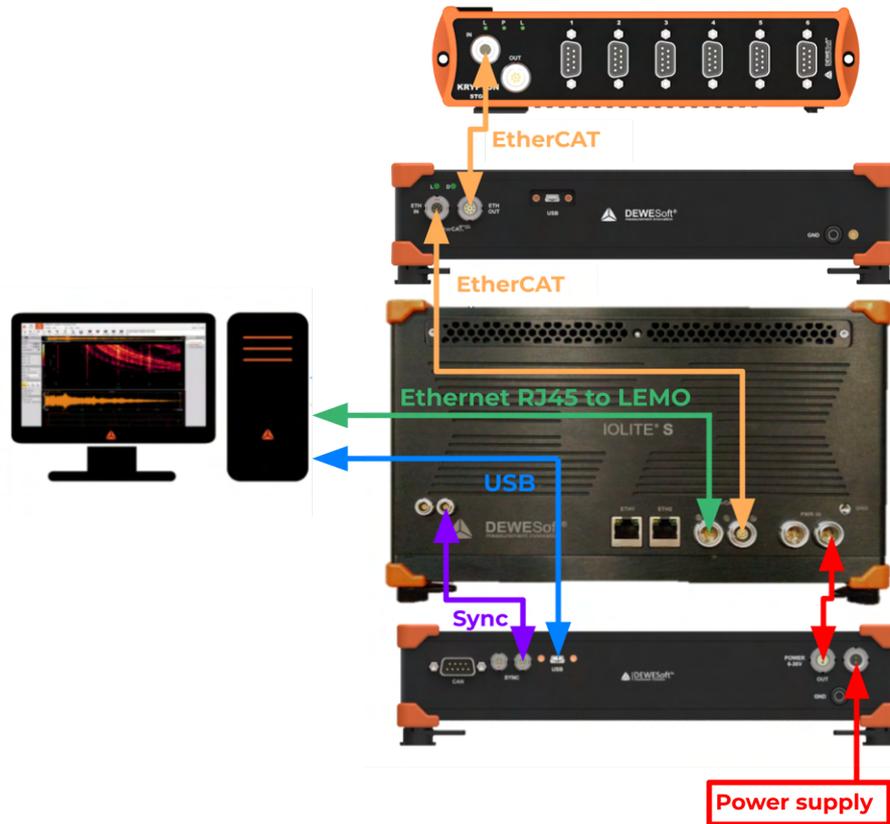
A mixed system with a built-in sync junction

List of required cables:

Function	Dewesoft order code
Power supply	PS-120-L1B2f
Supply Daisy chain	L1B2m-L1B2f
Ethercat	EtherCAT to EtherCAT: L1T8m-L1T8f, ECAT - PC connection: L1T8f-RJ45
Synchronization	L00B4m-L00B4m
USB	USB1-USB2s or USB1s-USB2s

4.15. Dimensions

4.15.1. Dimensions: SIRIUS

All solutions (Modular Solution, Boxed Solution, SBOX) have the same depth.
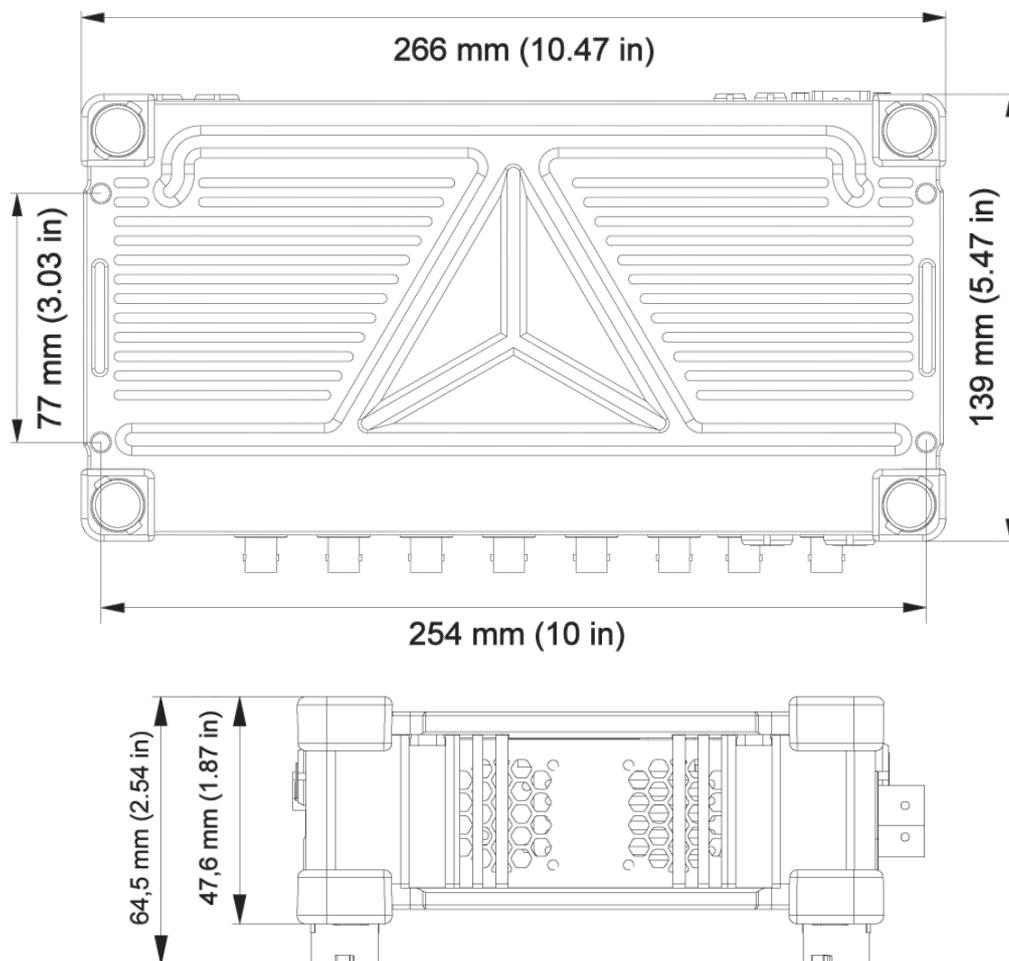
Dimensions: Single slice (modular solution)

4.15.2. Dimensions: SBOX
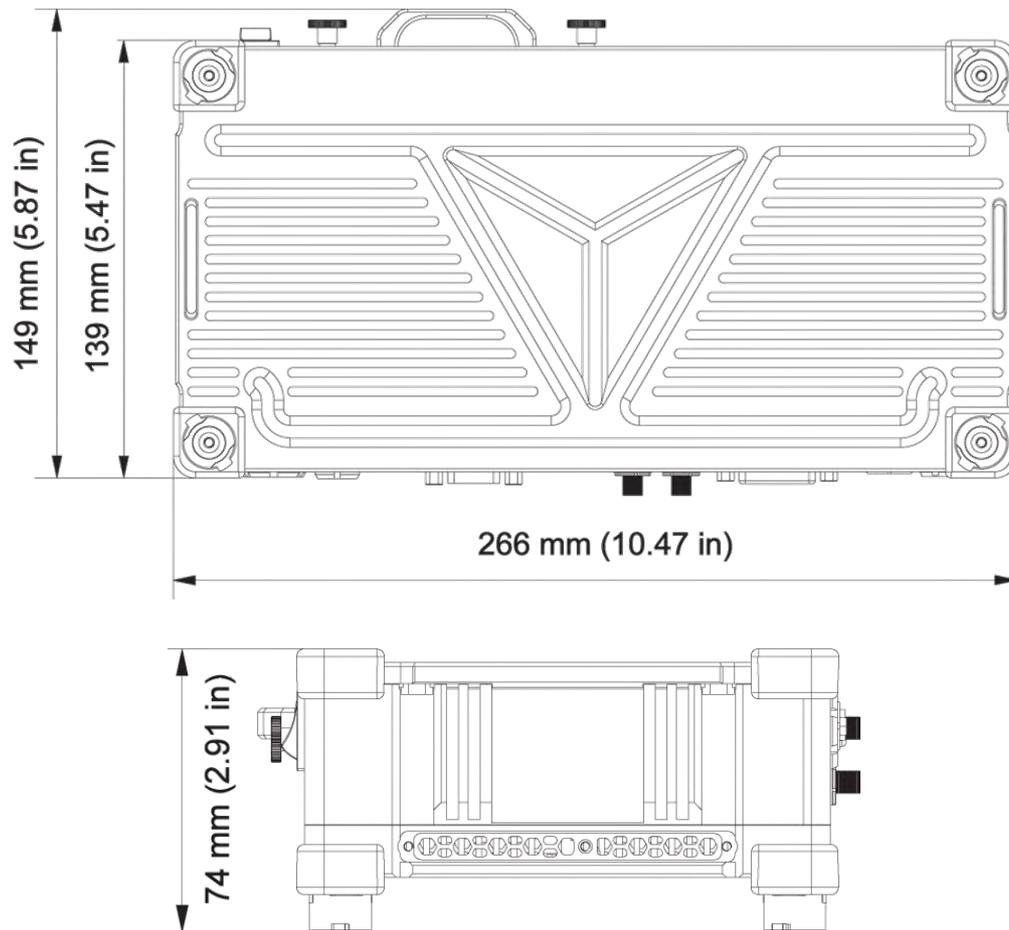
Dimensions: SBOXe
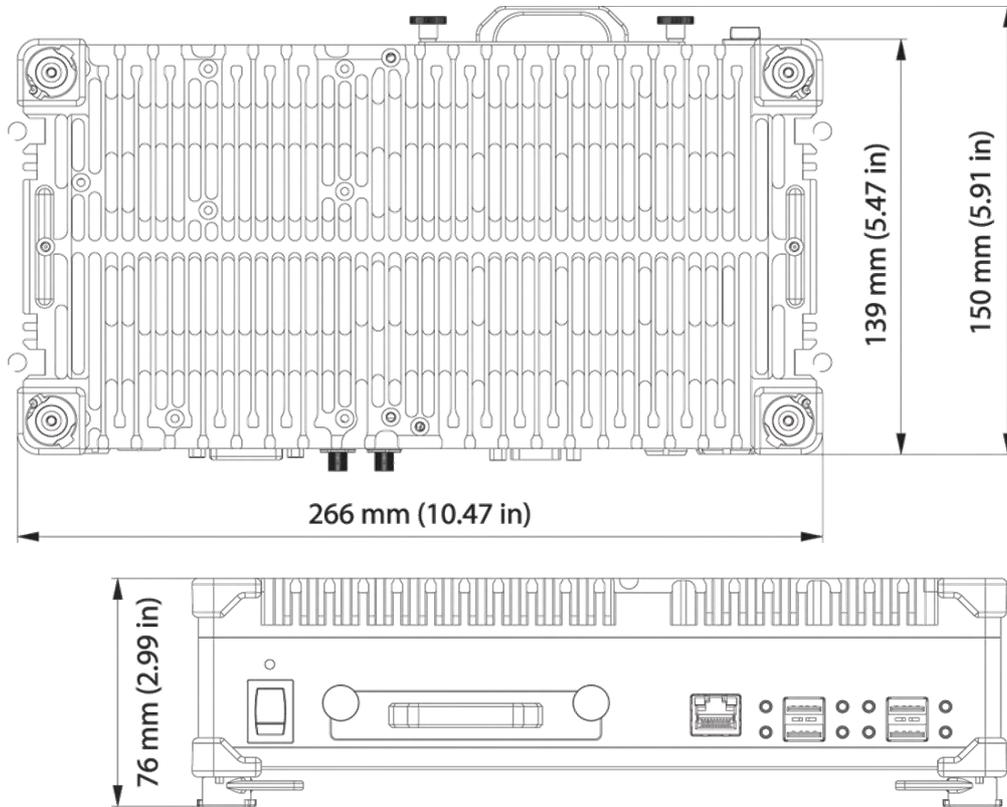
Dimensions: SBOXfe

4.15.3. Dimensions: SIRIUSwe
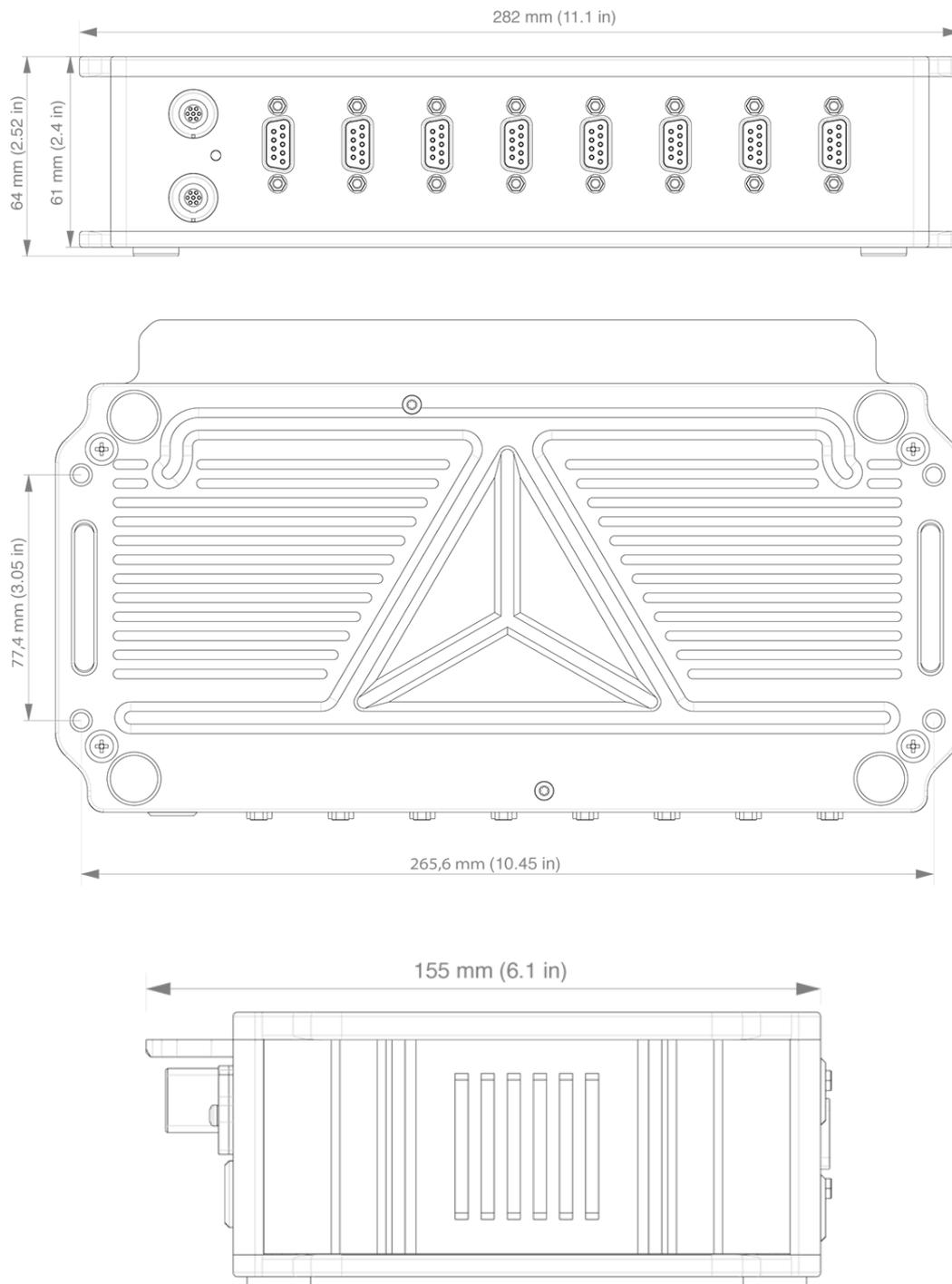
Dimensions: SIRIUSiwe

4.15.4. Dimensions: SIRIUSwe
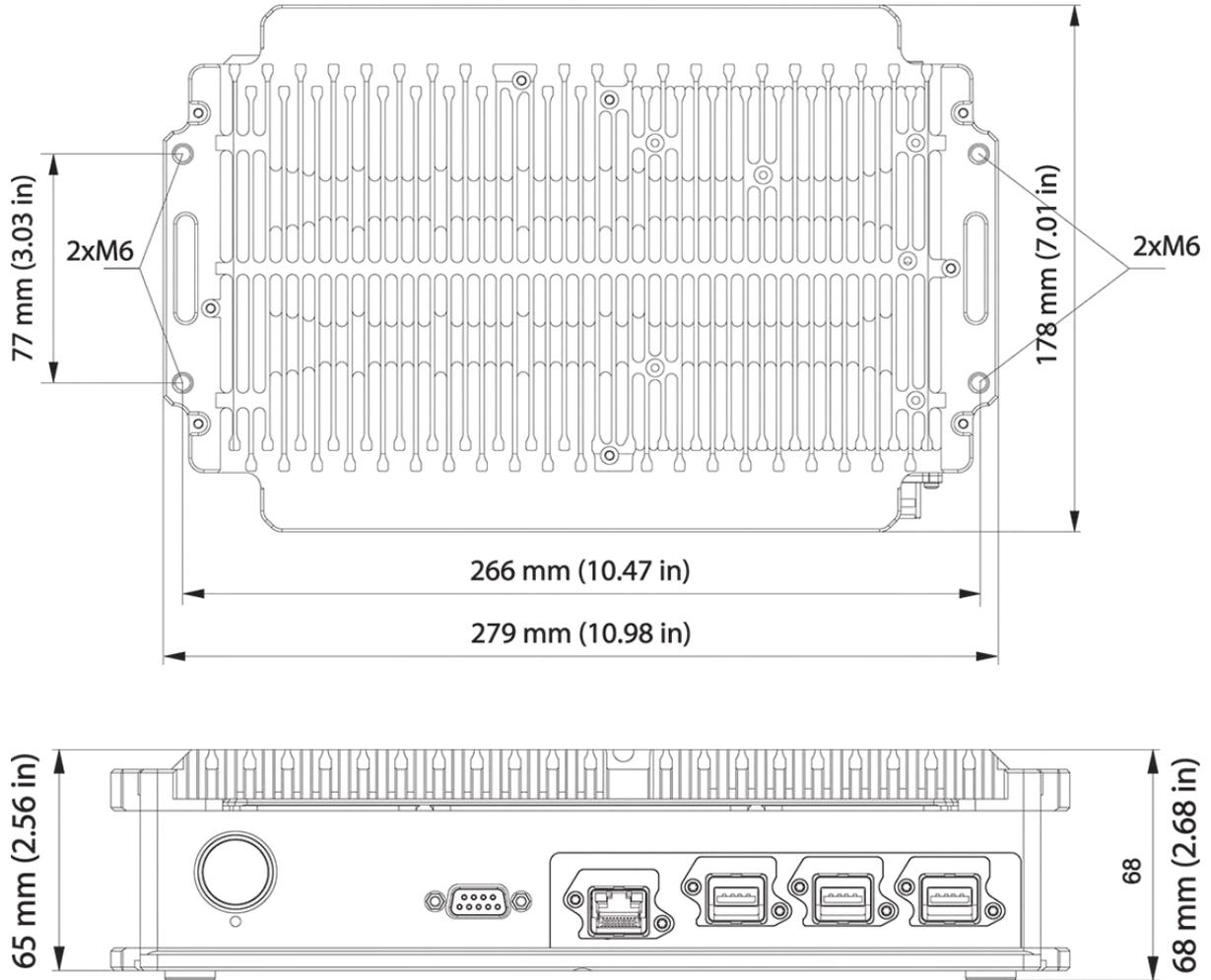
Dimensions: SBOXwe

4.15.5. Dimensions: Modular solution
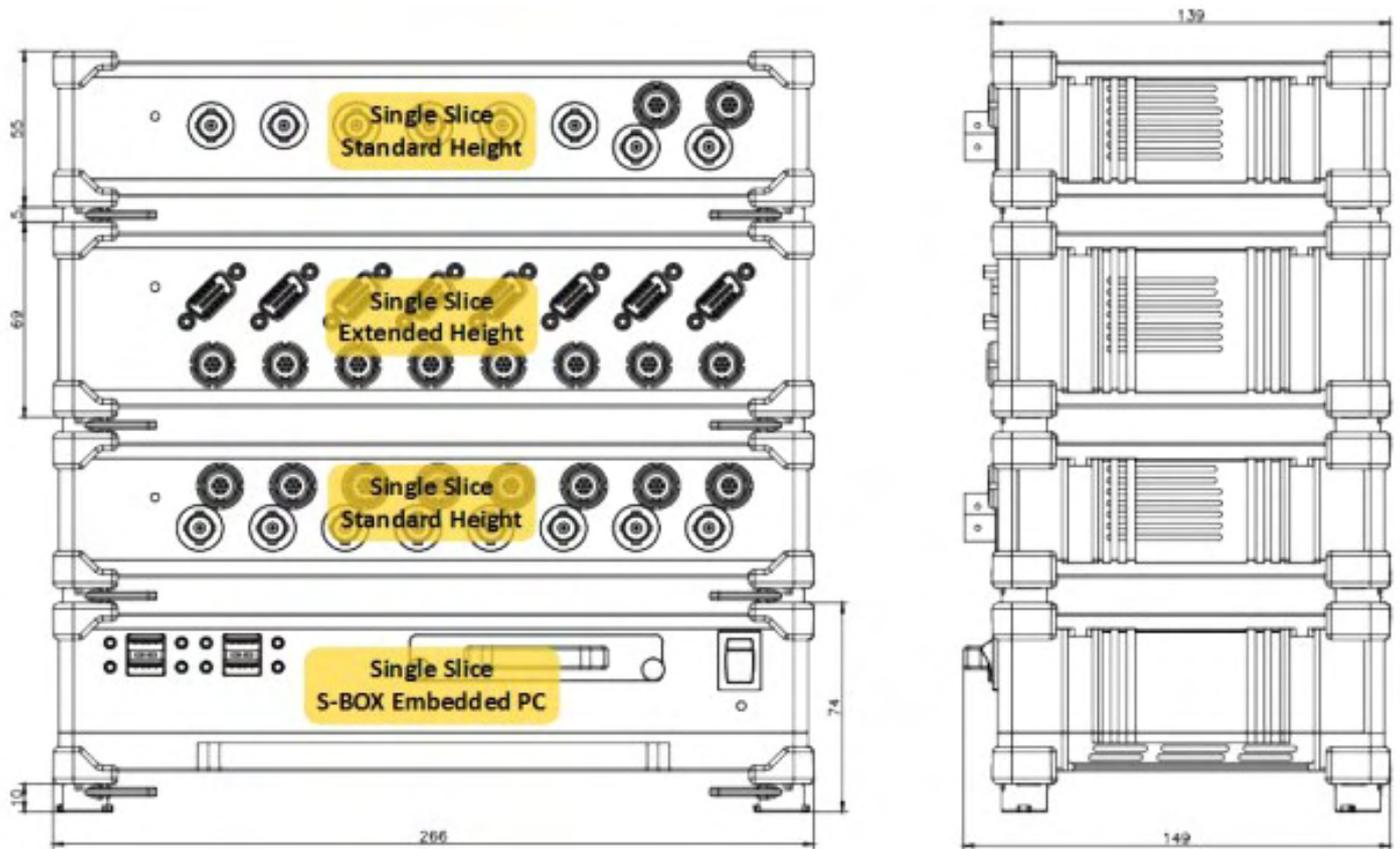
Dimensions: Modular solution

4.15.6. Dimensions: Boxed solution
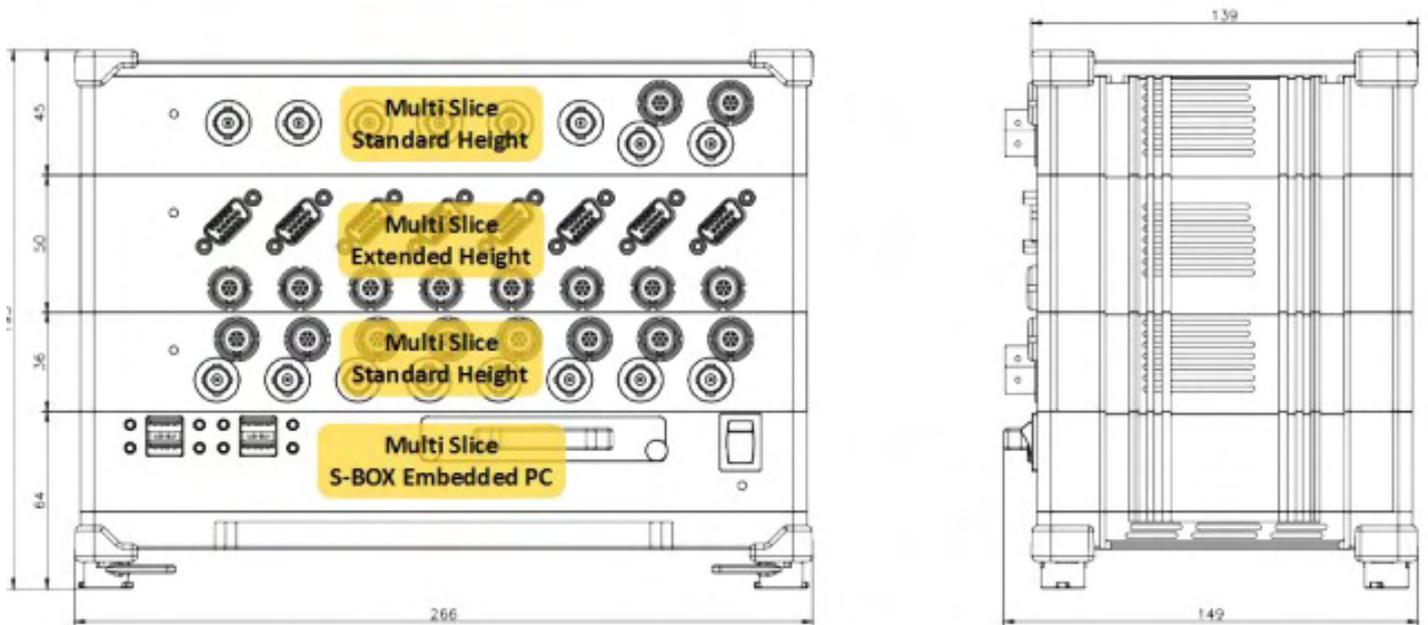
Dimensions: Boxed solution

4.15.7. Dimensions: R1DB

145 mm (5.71 in)

331 mm (13.03 in)

224 mm (8.82 in)
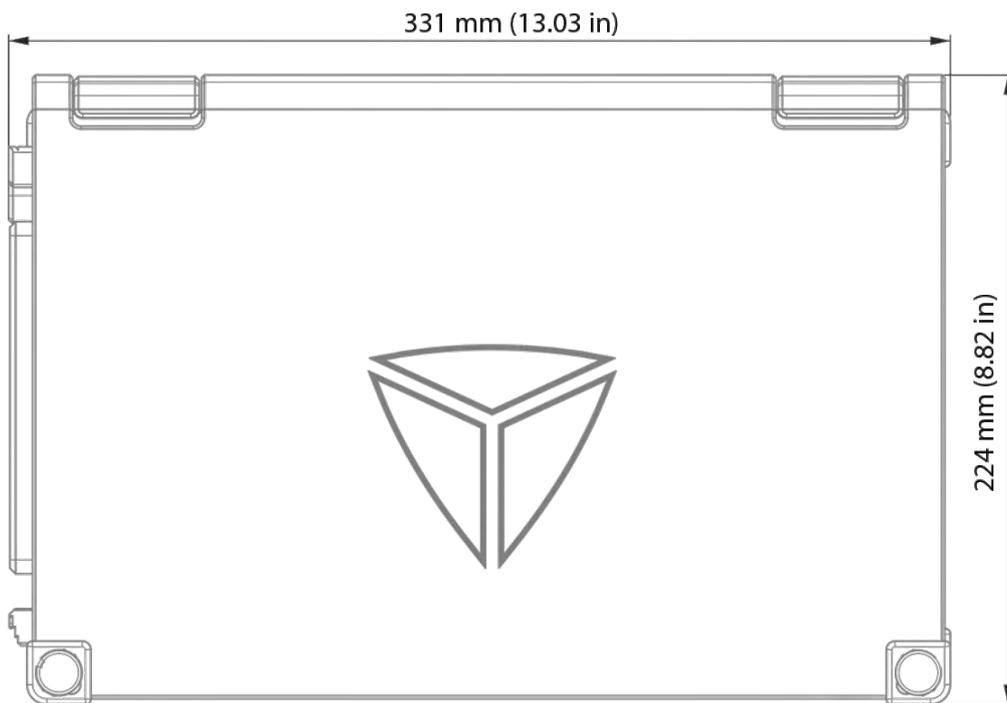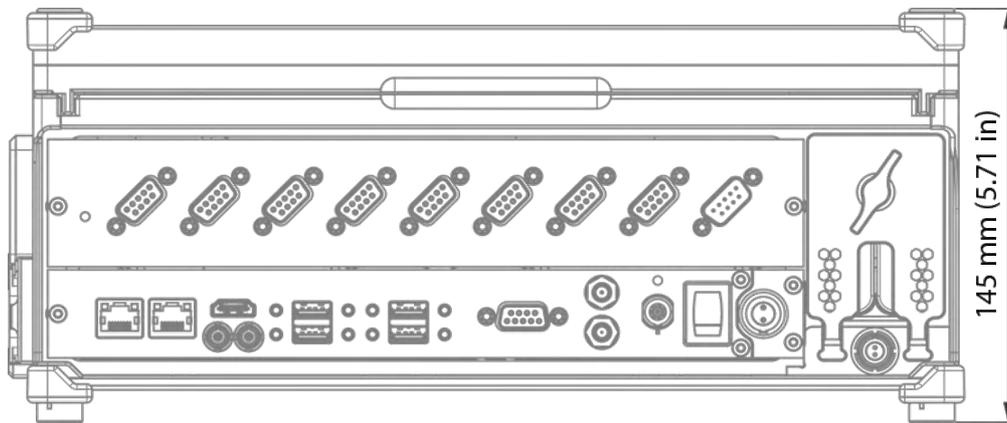
Dimensions: SIRIUS-R1

4.15.8. Dimensions: R2DB, R2D
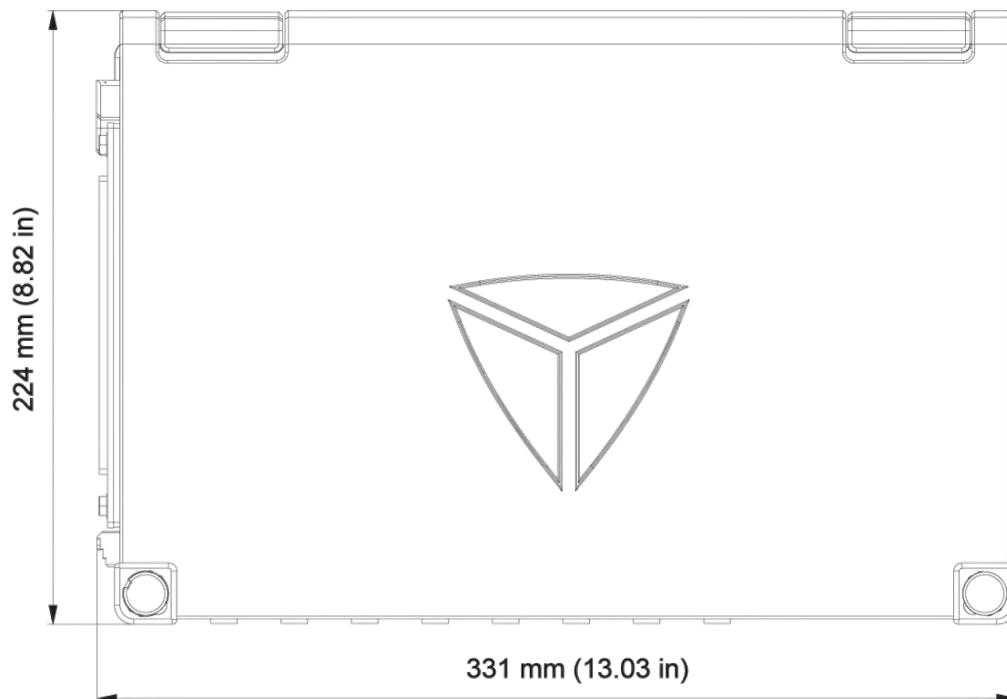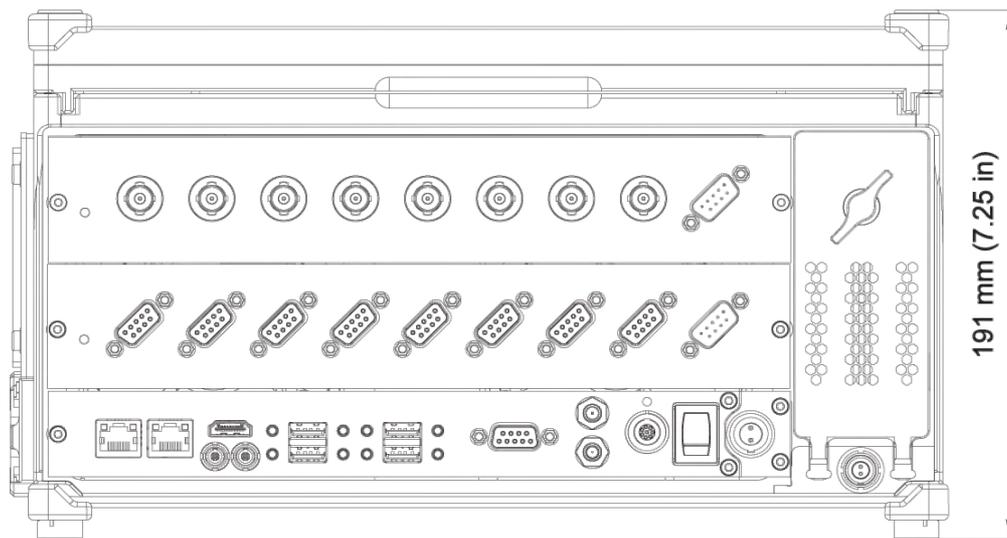
Dimensions: SIRIUS-R2

4.15.9. Dimensions: R3
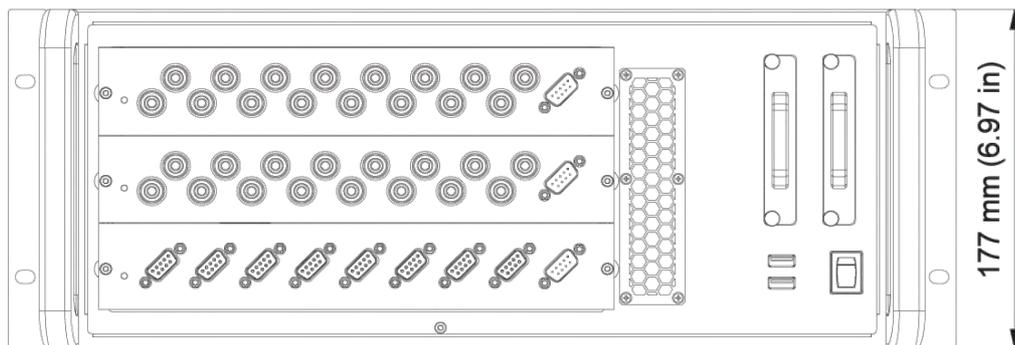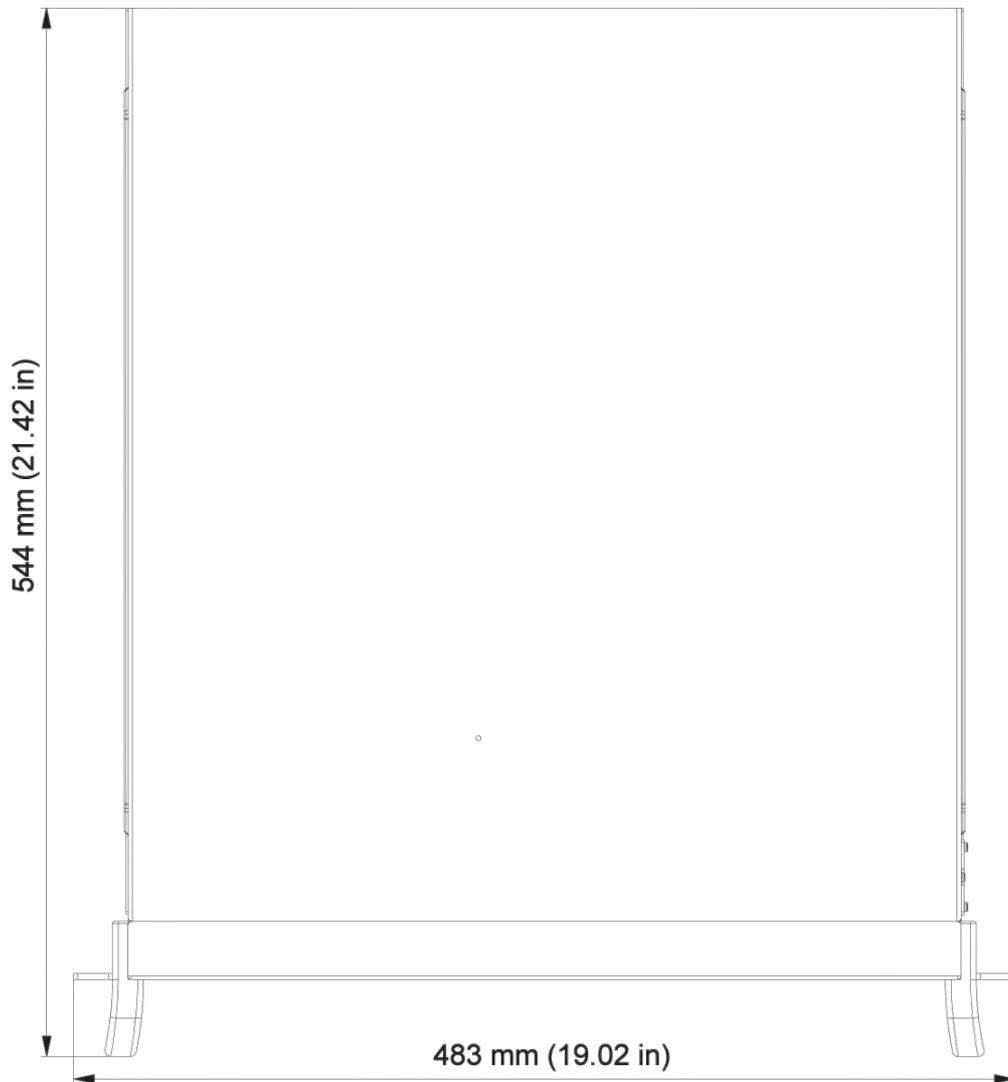
Dimensions: SIRIUS-R3

4.15.10. Dimensions: R4

264 mm (10.39 inch)

276 mm (10.87 inch)

124 mm (5.59 inch)
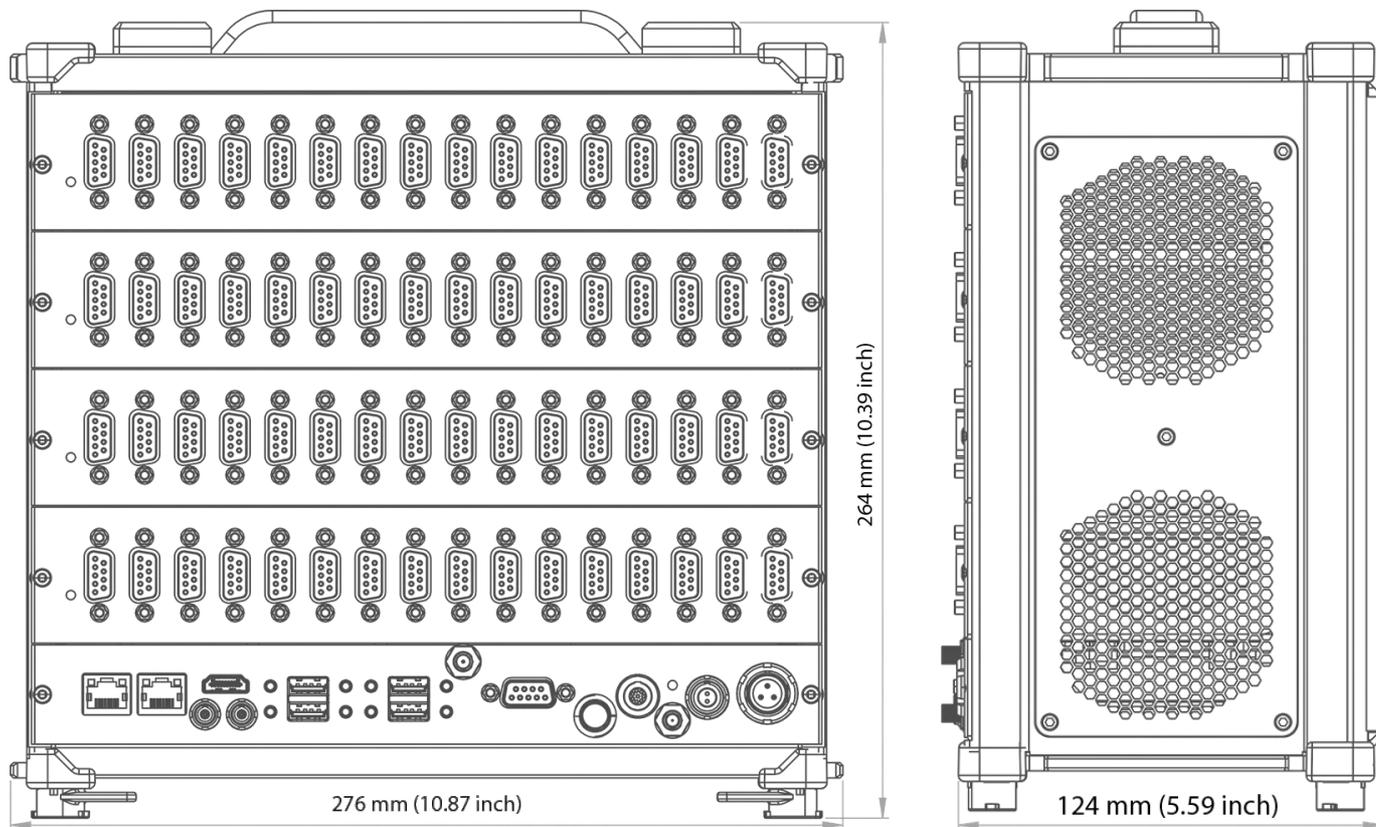
Dimensions: SIRIUS-R4

4.15.11. Dimensions: R8
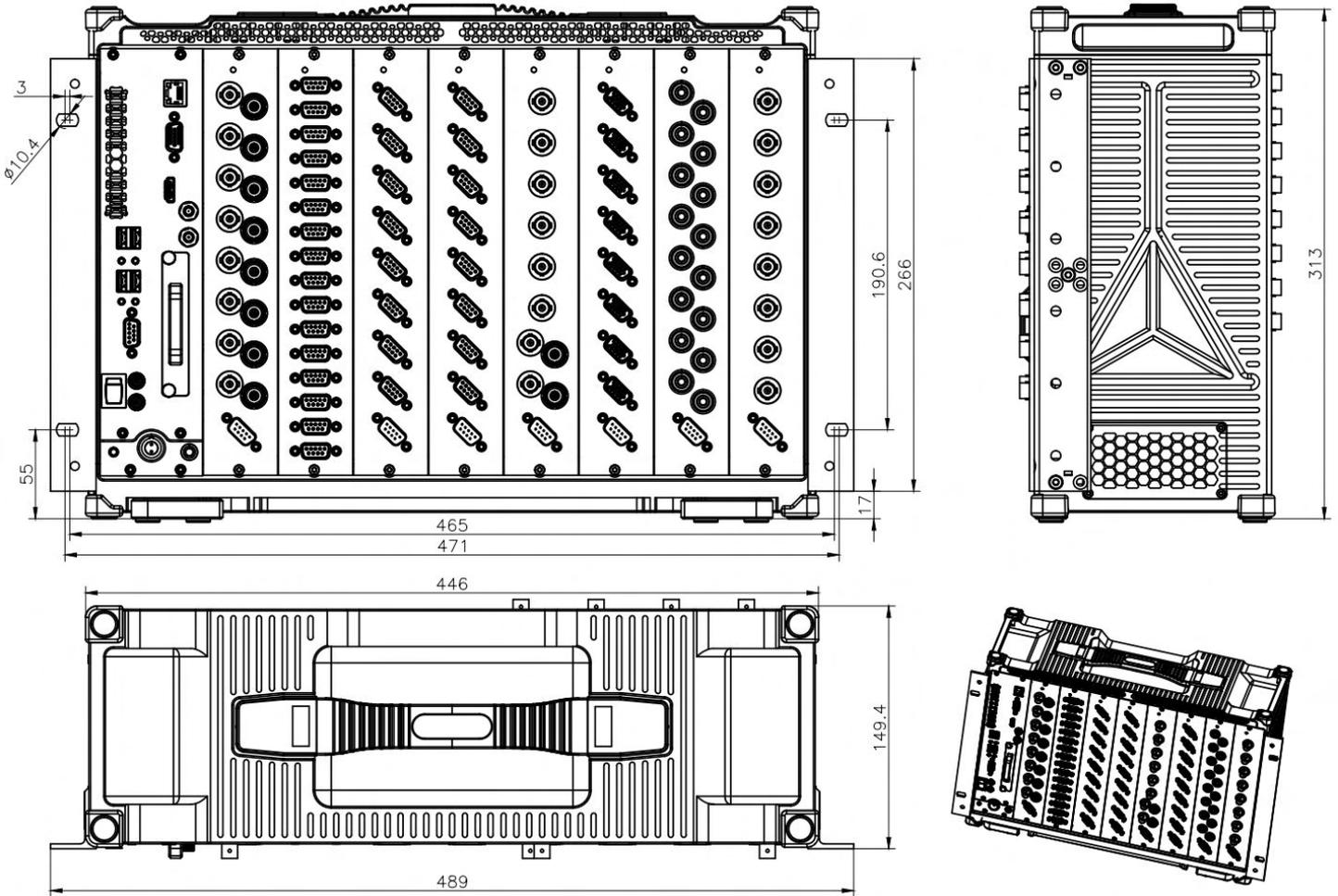
Dimensions: SIRIUS-R8

4.15.12. Dimensions: R8D
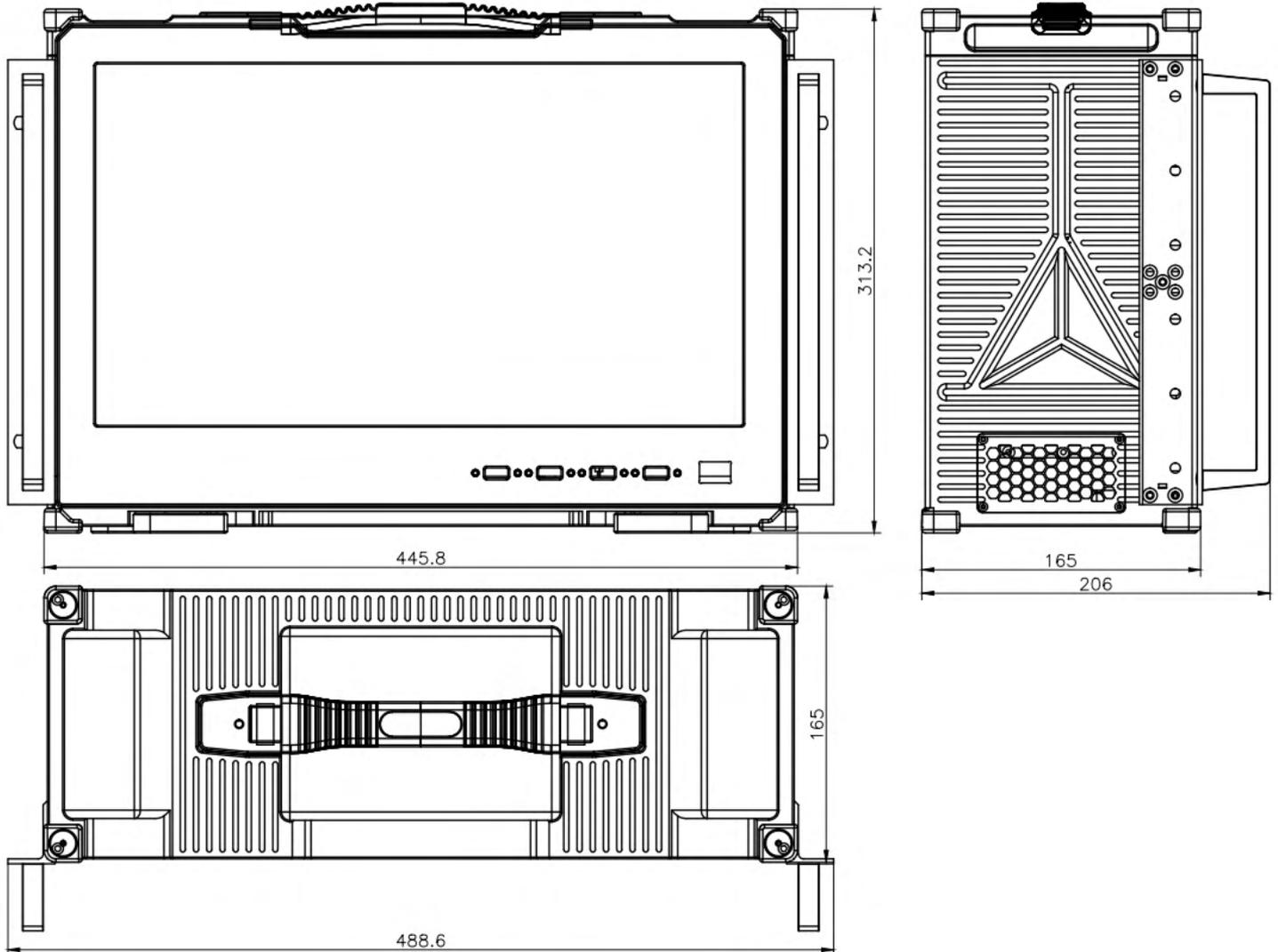
Dimensions: SIRIUS-R8D

4.15.12.1. Rack mounting

Front Handle Aluminium:
Screw M5x10 TX RF
19'' Bracket:
Screw M4X8 TX RF
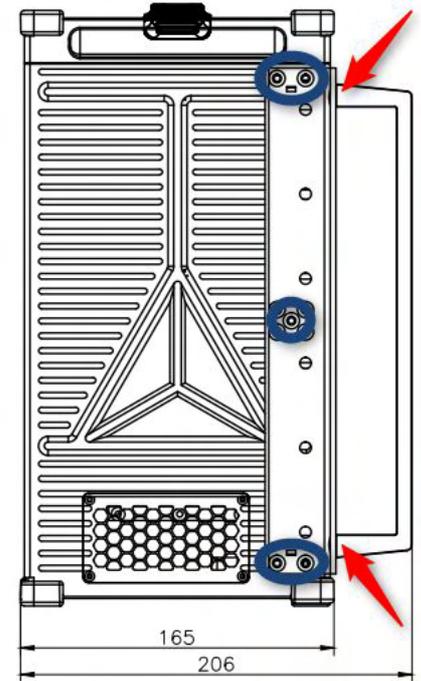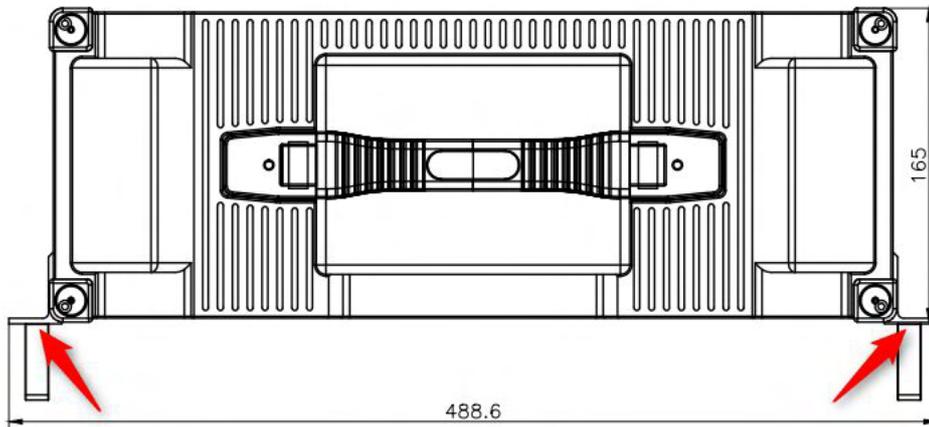
Dimensions: SIRIUS-R8 rack mounting

4.15.13. Dimensions: R8DB
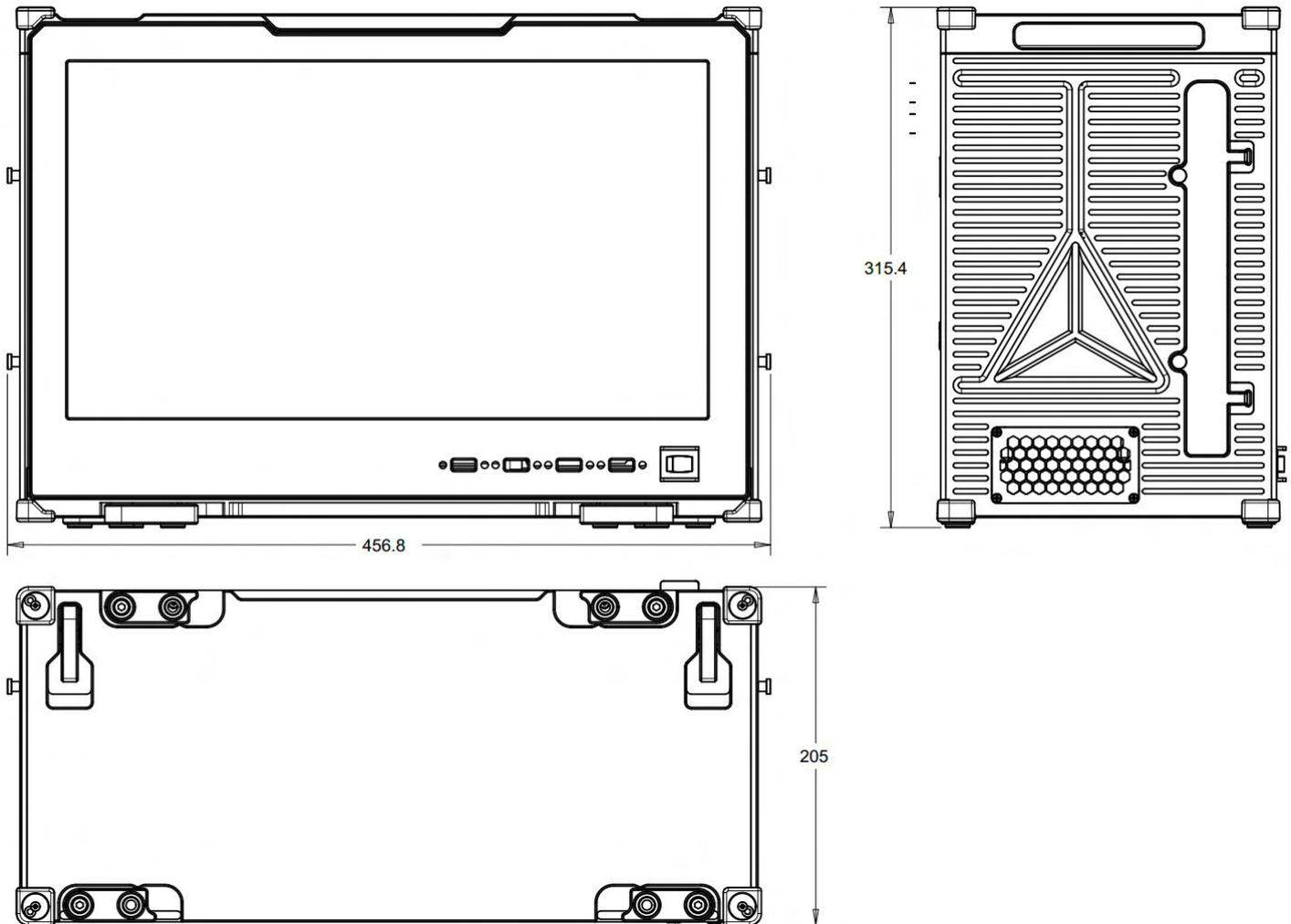
Dimensions: SIRIUS-R8DB

4.15.14. Dimensions: MINI
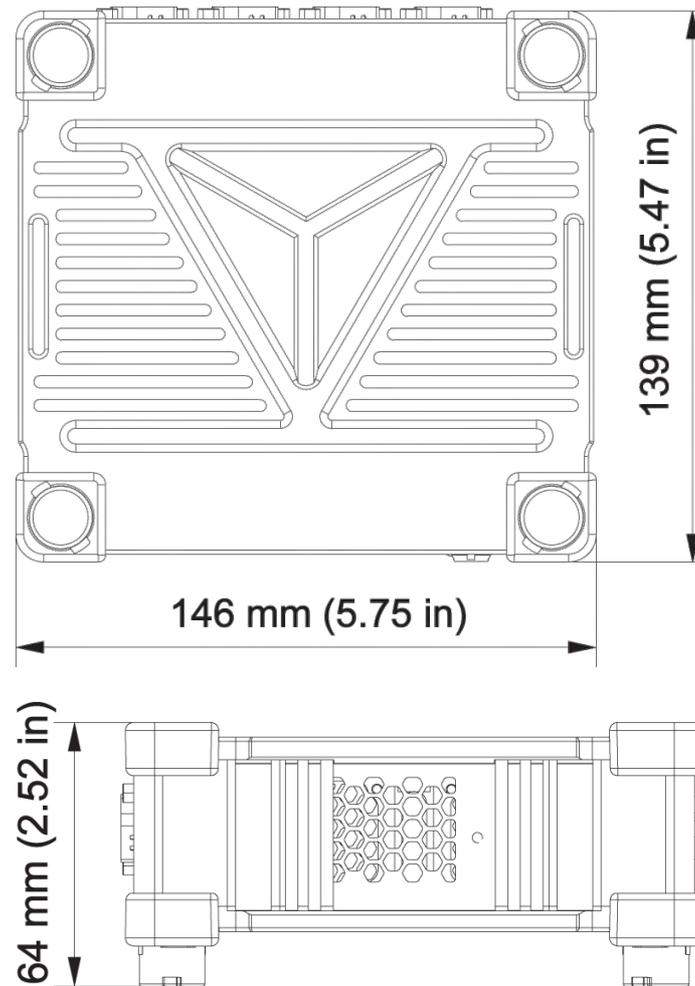
Dimensions: SIRIUSm

4.15.15. Dimensions: MINITAURs
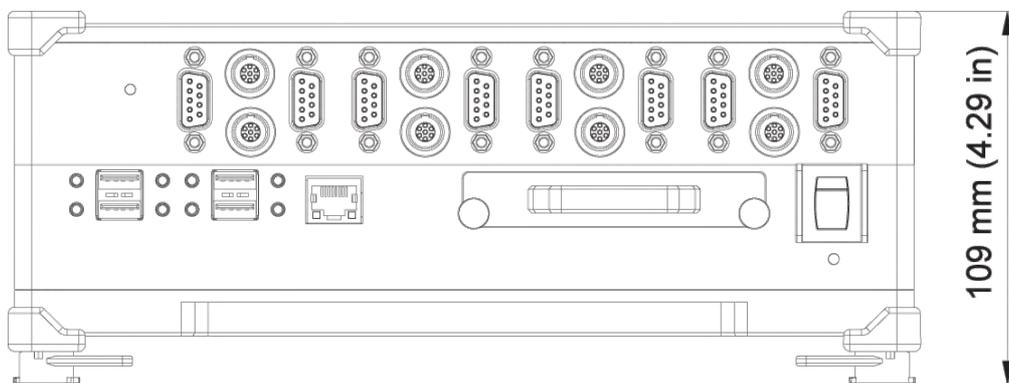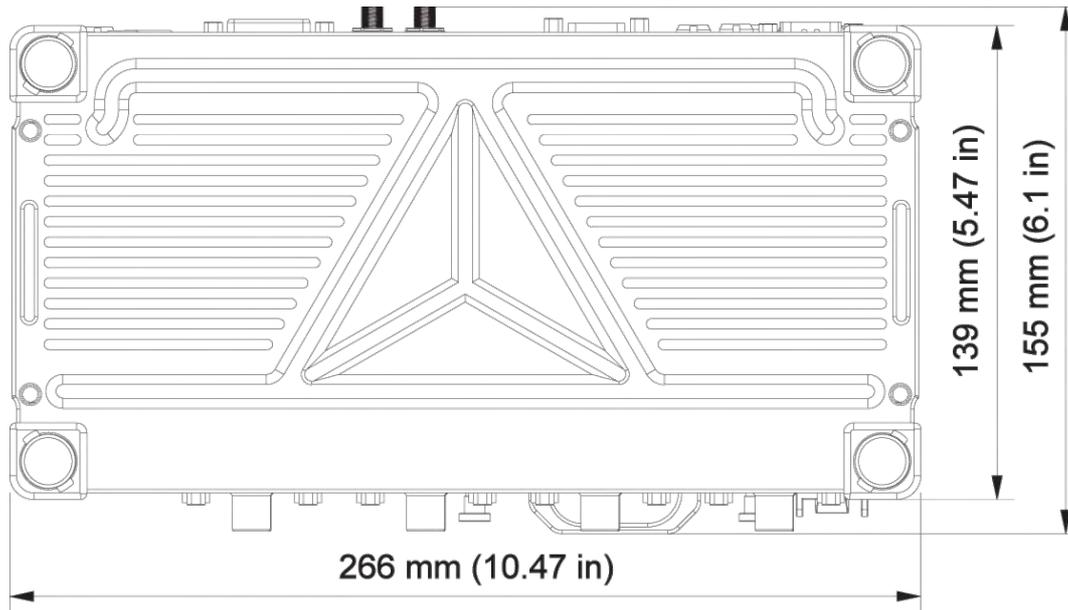
Dimensions: MINITAURs

5. SIRIUS® measurement modules

5.1. Data transfer overview

Dewesoft offers SIRIUS® slices that can use different data-transfer technologies:
- USB
    - high data-throughput allows for high sampling rates (up to 1 MS/s)
    - extra connectors for power and synchronisation required
    - direct connection to USB ports on the PC
- Standard EtherCAT®
    - only one single cable needed for data, synchronisation and power
    - Data-throughput allows for sampling rates up to 20 kS/s
    - direct connection to standard Ethernet port on the PC possible
- DS-EtherCAT+
    - this is a Dewesoft enhancement to the EtherCAT® standard, so that we can combine the advantages of Standard Ethernet and USB data-transfer

5.1.1. USB data transfer

USB is a high speed data bus being able to transmit full speed data for all channels to the measurement PC. The SIRIUS® USB slices allow sampling rates of up to 1 MHz (high-speed) and can be directly connected to native USB ports on the measurement PC (or SBOX). In comparison to the EtherCAT® version, the SIRIUS®-USB slices need extra connectors for power supply and synchronisation.

5.1.2. EtherCAT® data transfer

EtherCAT® - Ethernet for Control Automation Technology - is a 100 Mbit/s Ethernet-based fieldbus system. The protocol is standardized in IEC 61158 and is suitable for both hard and soft real-time requirements. EtherCAT® can be used for applications that require short data update times with low communication jitter (for precise synchronisation purposes).

Important

When connecting EtherCAT® devices to the computer please make sure that you connect the EtherCAT® cable directly to the Ethernet card of your PC without the use of network switches or hubs.

Important

The EtherCAT version of SIRIUS works with a range of 9 - 36V, and not up to 48V, even though the range is up to 48V for other product lines with EtherCAT.

5.1.2.1. Standard EtherCAT® features

Strong points of standard EtherCAT®:

- Point to point communication
- High distance between modules possible (75 m)
- Only a single cable for power, data and synchronisation
- 100x faster than CAN bus
- Real time performance
- Physically fully compatible to Ethernet: i.e. same connector, no Gate-modules or adapters required

Weak points of standard EtherCAT®:

- Master sends the empty message train i.e. when DewesoftX® is the master and does not send the empty message for some reason, there will be no data on the bus
- Real time performance required from computer
- No data-buffer on the devices
- Ethernet packet (no TCP/IP) is prone to data-loss
- Time synchronisation is mostly done based on master precision of sending messages

This makes standard EtherCAT® good for real-time application, but not good for data-acquisition.

Since the standard EtherCAT® is originally intended for real time, it lacks a few very important elements. This is why DewesoftX® uses an enhanced DS-EtherCAT+ protocol.

5.1.2.2. DS-ETHERCAT+

In comparison to standard EtherCAT® the DS-EtherCAT+ protocol has the following benefits:

- Buffering: DewesoftX® EtherCAT® devices buffer the measurement data for some seconds, so that all data can still be accessed, even if the Master (i.e. DewesoftX® on Windows®) is a little late.
- Synchronisation: DewesoftX® EtherCAT® devices can acquire the samples at an exact time stamp. The timestamp can be provided by an external timing source (e.g. GPS or IRIG)
- Retransmit: since EtherCAT® packets are below the TCP/IP level, the standard protocol does not handle lost packets. The enhanced DS-EtherCAT+ protocol will detect lost packets and retransmit them.

Notes:

- Since the SIRIUS® devices are EtherCAT® slaves, an external EtherCAT® master is required
- EtherCAT® needs a dedicated network interface: i.e. you cannot mix EtherCAT® to your existing Intranet (LAN network) or Internet1 (i.e. connect them to the same Ethernet-switch)
- In comparison to the SIRIUS-USB slices, the SIRIUS EtherCAT® modules do not have CAN and no analog output

Hint

The maximum number of samples per device using EtherCAT® bus is 160 kS/sec for all transmitted channels: i.e. for 8 channels the rate would be 20 kHz.
The maximum speed per bus is limited to the 100 Mbit EtherCAT® bus speed. When DewesoftX® is the master, it can utilize approximately half of this bandwidth, but other masters might be more efficient.

5.1.2.3. EtherCAT® specifications

Interface	
Data interface	EtherCAT®
Data Rate	100 Mbps Full Duplex bus speed
Max. Sample Rate	DualCore: 20 kS/sec, HD 10 kS/sec, HS 40 kS/sec
Max. Throughput per Chain	From 6 MB/s to 10 MB/s
Sync Accuracy	Below 1 sample to Sirius®
EtherCAT®	Max. Cable Length 100m
Max. Number of Units	64 or more (power injectors may be required)
Data Interface Connection	LEMO 1T EtherCAT® hybrid cable Single cable for data, power and sync, daisy chainable

5.1.3. Data transfer combinations

DewesoftX® can only acquire data from Dewesoft Hardware which uses the DS-EtherCAT+ protocol.
The SIRIUS EtherCAT® slices have 2 modes of operation:
- Buffered mode: for DewesoftX® software
- Standard EtherCAT® mode: for standard EtherCAT® masters

5.2. Technology overview

Module

Each SIRIUS® slice can contain up to 8 measurement modules. The illustration below "SIRIUS-HD module" shows an open SIRIUS® HD measurement slice. The highlighted green PCB ❶ is a single measurement module. You can see ❷ that this HD slice has 2 connectors (and thus 2 channels) which are both connected to the same measurement module.
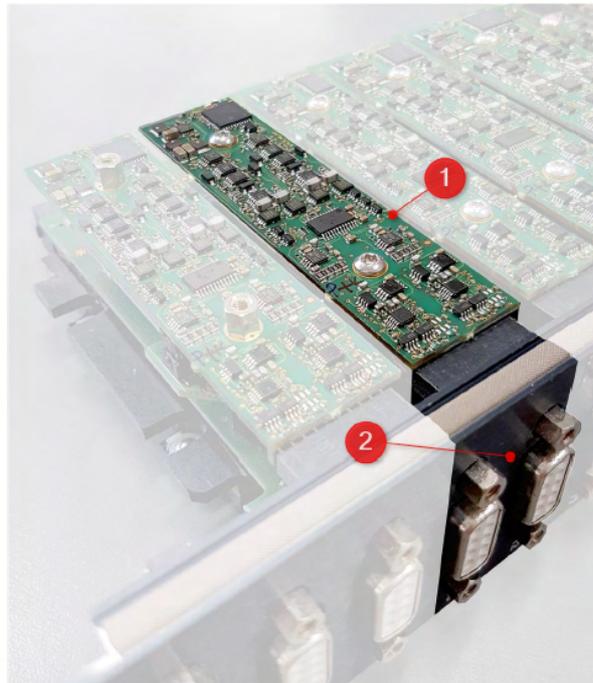
SIRIUS-HD module

The next illustration below "SIRIUS-STGM+ module" shows SIRIUS front with two STG-M+ modules in different colours. The first module ❶ is surrounded by yellow boxes, the 2nd module ❷ is highlighted with blue boxes. Each module has a DSUB-9 connector for the analog signals and a LEMO connector for the digital signals.
Note that the STGM (DSUB-9 female) & CNT (7-pin LEMO female) connectors for the 2 modules share the common electronic circuit inside. Thus you must always configure these modules as pairs.
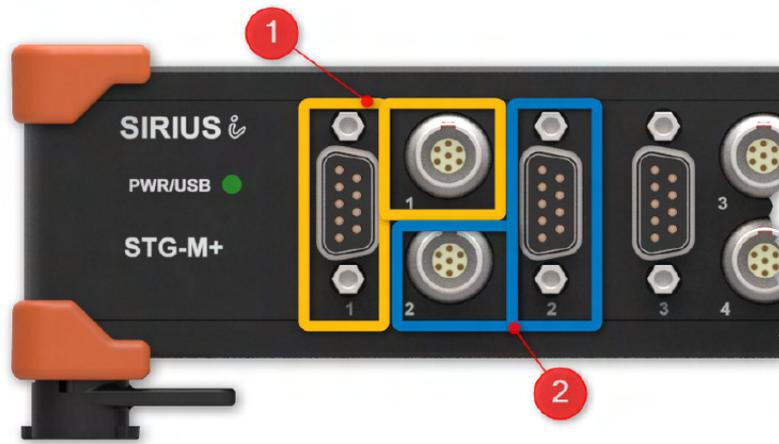
SIRIUSi-STGM+ module

5.2.1. SIRIUS® DUAL CORE series: high dynamic (up to 160 dB)

This new technology solves the often faced problem, that the signal is just much higher than expected and therefore clipped. Dewesoft DUAL CORE ADC technology always gives you the full possible measuring range, because the signal is measured with a high and a low gain at the same time.
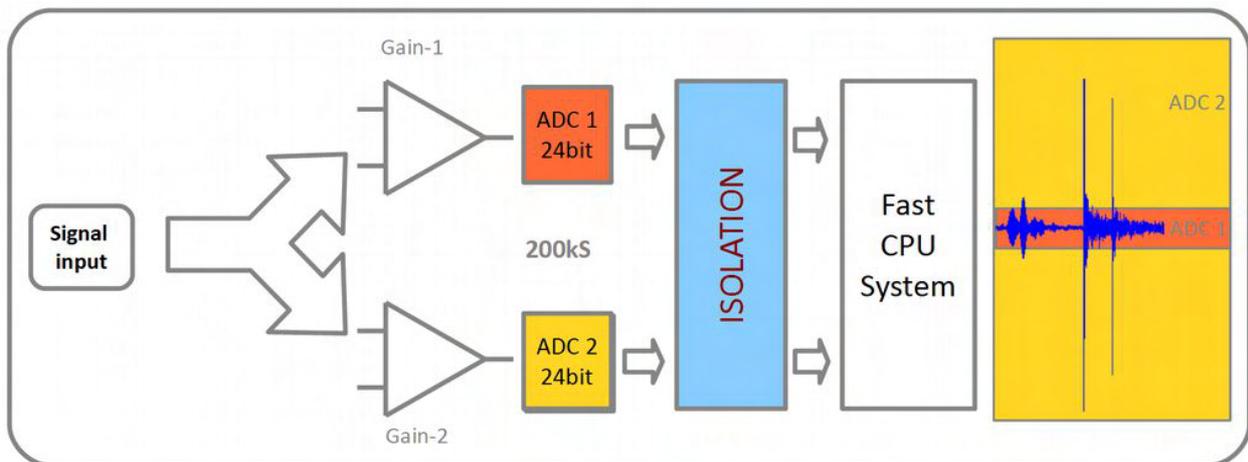
SIRIUS Dual Core

5.2.2. SIRIUS®-HD series: high density (16 channel per slice)

For highest channel density this solution offers 24-bit resolution with up to 200 kS/sec sample rate.

Important

The 2 amplifiers of the HD-modules share a common GND and are isolated against all other modules.
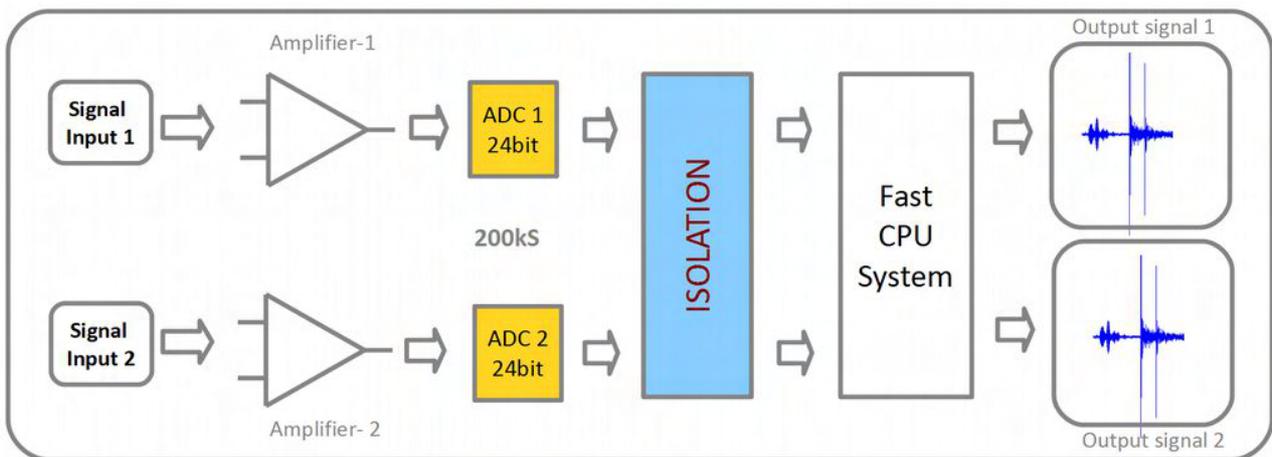
SIRIUS High Density

5.2.3. SIRIUS®-HS series: high speed and bandwidth

This series combines high bandwidth with alias free acquisition with 16-bit of up to 1 MS/sec acquisition rate.The analog anti-aliasing filter (100 kHz, 5th order Bessel) is combined with a free programmable digital IIR filter block inside the FPGA. For bandwidth requirements of up to 2 MHz the complete filter chain can be bypassed.
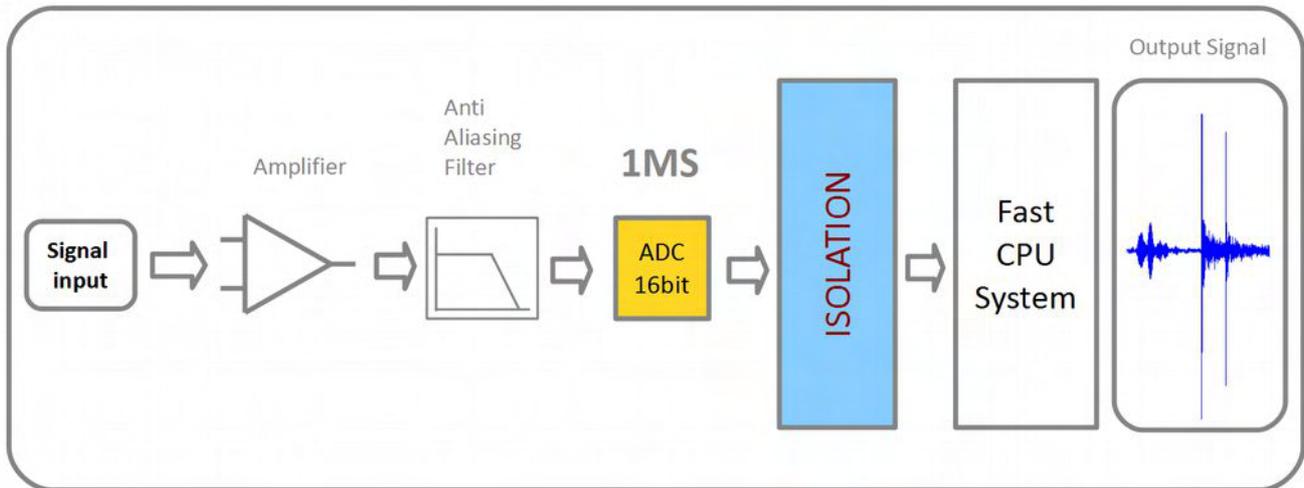
SIRIUS High Speed

5.2.4. Isolated version: EtherCAT®

The basic concept is the same as on the isolated USB version but the EtherCAT® slices do not have CAN or analog-output. They also do not have a separate sync-connector, since the synchronization is done via the EtherCAT® protocol. This version is available for DualCore, High Density and High Speed modules, as well as rack versions of all three.
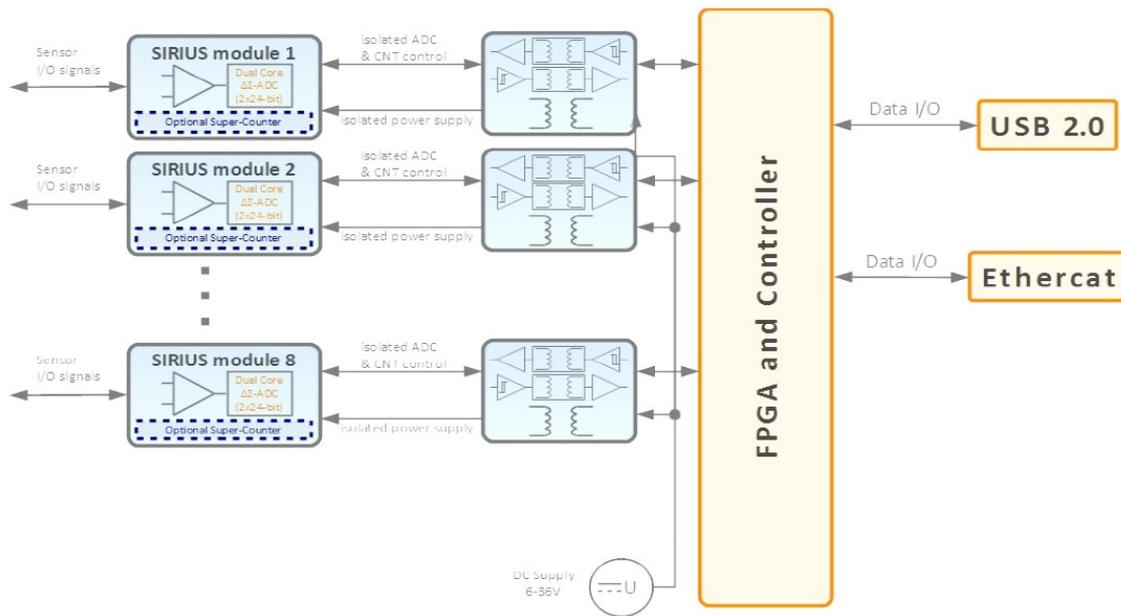
EtherCAT® Motherboard

> ⚠ **Warning**
> Be careful with voltages >25 VAC or >35 VDC! These voltages are already high enough in order to get a perilous electric shock by touching the wiring.

5.2.5. Isolated version: USB

The (standard) SIRIUSi modules are isolated between each other and the main board. Some modules generate power for electronics and for external pins: this power supply is again isolated against other modules, the main board and the housing.

Inside of one module, the power supply pins, counter and analog inputs are not isolated between themselves (they have the same ground) that is available on the GND connector pin (e.g. The analog input and the counter of one ACC+ module share the same GND).
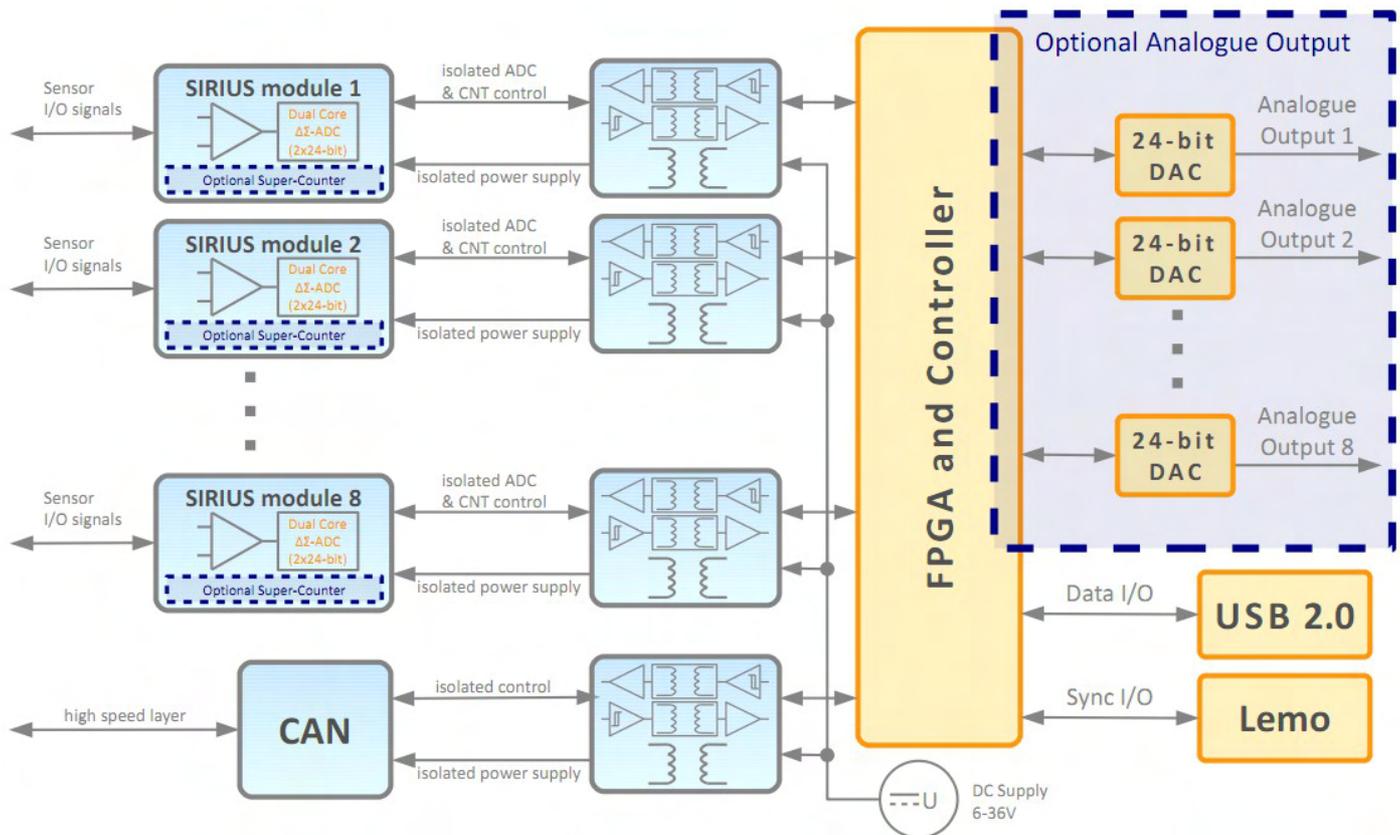
Isolated motherboard

⚠️ **Warning**

Be careful with voltages >25 VAC or >35 VDC! These voltages are already high enough in order to get a perilous electric shock by touching the wiring.

5.2.6. Differential version: USB

The basic concept is the same as on the isolated version but without galvanic isolation for the module power supply and the data interface.
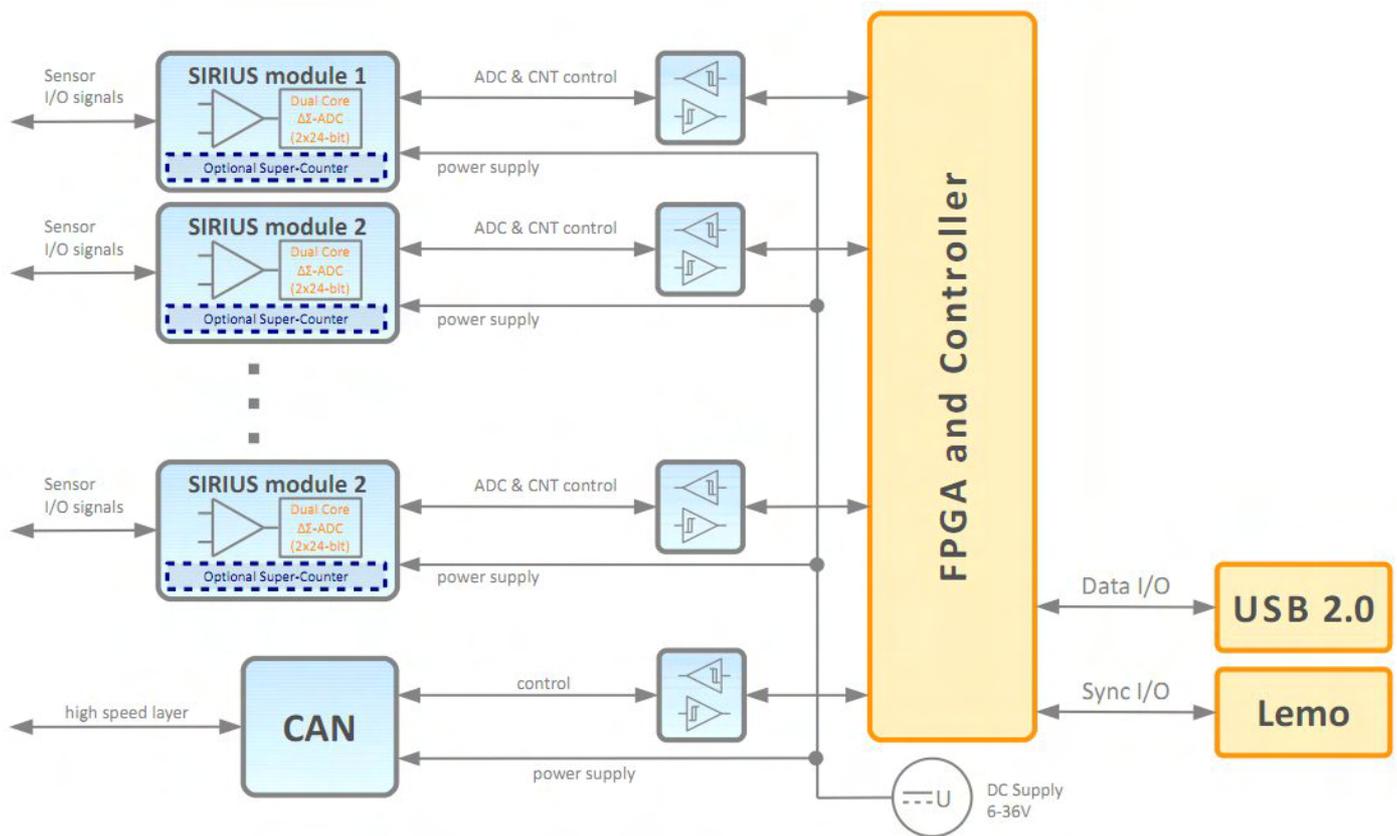
Differential motherboard

⚠ Warning

Be careful with voltages >25 VAC or >35 VDC! These voltages are already high enough in order to get a perilous electric shock by touching the wiring.

5.3. SIRIUS® slice configuration

SIRIUS is available in different versions and enclosures: as a standalone single slice or integrated in a Boxed Solution, Rack, etc.

5.3.1. Standard slice

5.3.1.1. SIRIUSi 8xACC

SIRIUSi-8xACC

5.3.1.2. SIRIUSi 6xACC, 2xACC+

SIRIUSi-6xACC-2xACC+

5.3.1.3. SIRIUSi 8xMULTI

SIRIUSi-8XMULTI

5.3.1.4. SIRIUSi 8xSTGM

SIRIUSi-8xSTGM

5.3.1.5. SIRIUSi 8xSTG

SIRIUSi-8xSTG

5.3.1.6. SIRIUSi 8xSTG-L2B10f

SIRIUSi-8xSTG-L2B10f

5.3.1.7. SIRIUSi 8xHV

SIRIUSi-8xHV

5.3.1.8. SIRIUSi HS 8xACC

SIRIUSi-HS-8xACC

5.3.1.9. SIRIUSi HD 16xSTGS

SIRIUSi-HD-16xSTGS

5.3.1.10. SIRIUSi HD 16xLV

SIRIUSi-HD-16xLV

5.3.1.11. SIRIUSi 8xMIC200

SIRIUSi-8xMIC200

5.3.1.12. SIRIUSi 8xUNI

SIRIUSi 8xUNI

5.3.2. Customized slice

We can build a customized slice with modules that you choose and in any order..

Example

SIRIUS costume slice containing: 2x ACC, 2x ACC+, 1x MULTI, 1x STG and 2x HV

SIRIUSi-CUSTOM-2xACC-BNC-2xACC+-1xMULTI-1xSTG-2xHV-BAN

5.3.3. SIRIUS Waterproof

SIRIUS Waterproof - Rugged and Modular Data Acquisition System
Extremely rugged (IP67 degree of protection) and fully isolated rugged data acquisition system for the most demanding testing in harsh environments. High-precision, high-dynamic, and high-bandwidth for all types of analog signals from IEPE to strain gages.

5.3.3.1. SIRIUSiwe 6xSTGM-2xSTGM+

SIRIUSiwe-6xSTGM-2xSTGM+

5.3.3.2. SIRIUSwe-HD-16xSTGS-L2B10f

SIRIUSwe-HD-16xSTGS-L2B10f

5.3.3.3. SIRIUSiwe 6xLV-2xLV+

SIRIUSiwe-6xLV-2xLV+

5.3.3.4. SIRIUSiwe HD 16xSTGS

SIRIUSiwe-HD-16xSTGS

5.3.3.5. SIRIUSiw 8xCAN

5.4. SIRIUS® Dual Core specifications

	UNI	STG	STGM	MULTI	ACC
Connectors	DSUB-9, L2B10f	DSUB-9, L2B7f, L2B10f	DSUB-9, L2B7f, L2B10f	DSUB-15, L2B16f	BNC, TNC
Counter version	✓	✓	✓	✓	✓
Isolated version	✓	✓	✓	✓	✓
Differential version	✓	✓	✓	✓	✓
EtherCAT version	✓	✓	✓	✓	✓
Rack version	✓	✓	✓	✓	✓
Fanless version	✗	✗	✓	✗	✓
Channels per slice	8	8	8	8	8
Data rate / channel	200 kS/sec USB, 20 kS/sec EtherCAT	200 kS/sec USB, 20 kS/sec EtherCAT	200 kS/sec USB, 20 kS/sec EtherCAT	200 kS/sec USB, 20 kS/sec EtherCAT	200 kS/sec USB, 20 kS/sec EtherCAT
Resolution	24-bit dual core	24-bit dual core	24-bit dual core	24-bit dual core	24-bit dual core
Bandwidth	70 kHz	70 kHz	70 kHz	70 kHz	70 kHz
Voltage ranges	±100 V, ±10 V, ±1 V, ±100 mV, ±10 mV	±50 V, ±10 V, ±1 V, ±100 mV	±10 V, ±1 V, ±100 mV, ±10 mV	±10 V, ±1 V, ±100 mV, ±50 mV	±10 V, ±500 mV
Input coupling	DC, AC 0.3 Hz / 0.16 Hz (1, 3, 5, 10, 20 Hz SW)	DC, AC 1 Hz (3, 10 Hz SW)	DC	DC	DC, AC 0.1 Hz, 1 Hz
Sensor excitation	0..20 V max. 0.8 W, 0..60 mA max 0.5 W, IEPE 2..20 mA	0..20 V max. 0.8 W, 0..60 mA max 0.5 W	0..15 V max. 44 mA	0..12 V max. 44 mA	IEPE 2, 4, 8, 12, 16, 20 mA
Bridge connection	Full, ½, ¼ 350 Ω, ¼ 120 Ω 3, 4 wire	Full, ½, ¼ 350 Ω, ¼ 120 Ω 3, 4 wire	Full, ½, ¼ 350 Ω, ¼ 120 Ω 3 wire	Full, ½, ¼ 350 Ω, ¼ 120 Ω 3 wire	✗
Programmable shunt	59.88 kΩ, 175 kΩ bipolar	59.88 kΩ, 175 kΩ bipolar	100 kΩ bipolar	59.88 kΩ	✗
IEPE input	✓	DSI-ACC	DSI-ACC	DSI-ACC	✓
Resistance	✓	✓	✗	✗	✗
Temperature (PTx)	✓	✓	DSI-RTD	DSI-RTD	✗
Thermocouple	DSI-TH	DSI-TH	DSI-TH	DSI-TH	✗
Current	ext. shunt, DSI	ext. shunt, DSI	ext. shunt, DSI	ext. shunt, DSI	ext. shunt
Potentiometer	✓	✓	✓	✓	✗
LVDT	DSI-LVDT	DSI-LVDT	DSI-LVDT	DSI-LVDT	✗
Charge	DSI-CHG	DSI-CHG	DSI-CHG	DSI-CHG	✗
TEDS	✓	✓	✓	✓	✓
Isolation voltage	1000 V	1000 V	1000 V	1000 V	1000 V
Power consumption per channel	2 W/ch	2 W/ch	1.3 W/ch	1.3 W/ch	1 W/ch
Advanced functions	Supports all strain types, IEPE sensors and high input range	Supports all strain types and high input range	Low power, sensor and amplifier balance, bipolar shunt	Analog Output, Low power, sensor and amplifier balance	Sensor error detection, high dynamic range
(1) Fanless operation only for BNC or Banana version (without excitation)					

	MIC200	CHG	HV	LV
Connectors	L1B7f	BNC, TNC	BANANA	DSUB-9, BNC, BANANA
Counter version	✗	✓	✗	✓
Isolated version	✓	✓	✓	✓
Differential version	✗	✗	✗	✓
EtherCAT version	✓	✓	✓	✓
Rack version	✓	✓	✓	✓
Fanless version	✓	✗	✓	✓ (see 1)
Channels per slice	8	8	8	8
Data rate / channel	200 kS/sec USB, 20 kS/sec EtherCAT	200 kS/sec USB, 20 kS/sec EtherCAT	200 kS/sec USB, 20 kS/sec EtherCAT	200 kS/sec USB, 20 kS/sec EtherCAT
Resolution	24-bit dual core	24-bit dual core	24-bit dual core	24-bit dual core
Bandwidth	70 kHz	70 kHz	70 kHz	70 kHz
Voltage ranges	±10 V, ±500 mV	±10 V, ±500 mV	±1200 V, ±50 V	±200 V, ±10 V, ±1 V, ±100 mV
Input coupling	AC 0.35 Hz (3, 10 Hz SW)	DC, AC 0.1 Hz, 1 Hz, 10 Hz, 100 Hz	DC	DC, AC 1 Hz (3, 10 Hz SW)
Sensor excitation	14 V bipolar, 200 V polarization	IEPE 4, 8, 12 mA	✗	2..30 V bipolar, 0..24 V unipolar, max. 0.2 A / 2 W
Bridge connection	✗	✗	✗	Full
Programmable shunt	✗	✗	✗	✗
IEPE input	✗	✓	✗	DSI-ACC
Resistance	✗	✗	✗	✗
Temperature (PTx)	✗	✗	✗	DSI-RTD
Thermocouple	✗	✗	✗	DSI-TH
Current	ext. shunt	ext. shunt	✗	ext. shunt, DSI
Potentiometer	✗	✗	✗	✗
LVDT	✗	✗	✗	DSI-LVDT
Charge	✗	100 k, 10 k pC	✗	DSI-CHG
TEDS	✓	✓	✗	✓
Isolation voltage	1000 V	1000 V	CAT II 1000 V	1000 V
Power consumption per channel	1.1 W/ch	1.2 W/ch	1 W/ch	1.2 W/ch
Advanced functions	Supports polarized condenser microphones	Sensor error detection in IEPE and CHG mode (injection)	High voltage, high isolation	High sensor power and multi range
(1) Fanless operation only for BNC or Banana version (without excitation)				

5.5. SIRIUS® HD and HS specifications

SIRIUS HS

	HS-HV	HS-LV	HS-ACC	HS-CHG	HS-STG
Connectors	BANANA	DSUB-9, BNC, BANANA	BNC	BNC, TNC	DSUB-9
Counter version	✗	✓	✓	✓	✓
Isolated version	✓	✓	✓	✓	✓
Differential version	✗	✓	✓	✓	✓
EtherCAT version	✓	✓	✓	✗	✓
Rack version	✓	✓	✓	✓	✓
Fanless version	✓	✓ (see 1)	✗	✗	✗
Channels per slice	8	8	8	8	8
Data rate / channel	1 MS/s	1 MS/s	1 MS/s	1 MS/s	1 MS/s
Resolution	16-bit	16-bit	16-bit	16-bit	16-bit
Bandwidth	2 MHz	1 MHz	500 kHz	500 kHz	1 MHz
Voltage ranges	±2000 V … ±20 V	±100 V … ±50 mV	±10 V … ±200 mV	±10 V … ±100 mV	±50 V … ±20 mV
Input coupling	DC	DC, AC 1 Hz (3, 10 Hz SW)	DC, AC 1 Hz (3, 10 Hz SW)	DC, AC 0.1 Hz, 1 Hz, 10 Hz, 100 Hz	DC, AC 1 Hz (3, 10 Hz SW)
Sensor excitation	✗	2…30 V bipolar, 0…24 V unipolar, max. 0.2 A / 2 W	IEPE 4 mA, 8 mA	IEPE 4, 8, 12 mA	0…20 V max. 0.8 W, 0..60 mA max 0.5 W
Bridge connection	✗	Full	✗	✗	Full, ½, ¼ 350 Ω, ¼ 120 Ω, 3 or 4 wire
Programmable shunt	✗	✗	✗	✗	59.88 kΩ, 175 kΩ bipolar
IEPE input	✗	DSI-ACC	✓	✓	DSI-ACC
Resistance	✗	✗	✗	✗	✓
Temperature (PTx)	✗	DSI-RTD	✗	✗	✓
Thermocouple	✗	DSI-TH	✗	✗	DSI-TH
Potentiometer	✗	✗	✗	✗	✓
LVDT	✗	DSI-LVDT	✗	✗	DSI-LVDT
Charge	✗	DSI-CHG	✗	1 k …100 k pC	DSI-CHG
Current	✗	ext. shunt, DSI	ext. shunt	ext. shunt	ext. shunt, DSI
TEDS	✗	✓	✓	✓	✓
Isolation voltage	CAT II 1000 V	1000 V	1000 V	1000 V	1000 V
Power consumption per channel	1 W/ch	1.2 W/ch	2 W/ch	1.2 W/ch	2 W/ch
Advanced functions	High voltage, high bandwidth, high isolation	High sensor power and multi range	Sensor error detection, high speed	Sensor error detection in IEPE and CHG mode (injection)	High speed, supports all strain types and high input range
(1) Fanless operation only for BNC or Banana version (without excitation)					

SIRIUS HD

	HD-STGS	HD-LV	HD-ACC
Connectors	DSUB-9, L1B10f	DSUB-9, BNC	BNC
Counter version	✗	✗	✗
Isolated version	✓	✓	✓
Differential version	✓	✓	✓
EtherCAT version	✓	✓	✓
Rack version	✓	✓	✓
Fanless version	✗	✗	✗
Channels per slice	16	16	16
Data rate / channel	200 kS/sec USB, 10 kS/sec EtherCAT	200 kS/sec USB, 10 kS/sec EtherCAT	200 kS/sec USB, 10 kS/sec EtherCAT
Resolution	24-bit	24-bit	24-bit
Bandwidth	70 kHz	71 kHz	72 kHz
Voltage ranges	±10 V, ±1 V, ±100 mV, ±10 mV	±100 V, ±10 V, ±1 V, ±100 mV	±10 V, ±5 V, ±1 V, ±200 mV
Input coupling	DC	DC	DC, AC 0.1 Hz, 1 Hz
Sensor excitation	0..12 V max. 44 mA	2...30 V bipolar, 0...24 unipolar, max. 0.2 A / 2 W	IEPE 4,8,12 mA
Bridge connection	Full, ½, ¼ 350 Ω, ¼ 120 Ω 3-wire	Full	✗
Programmable shunt	100 kΩ	✗	✗
IEPE input	DSI-ACC	DSI-ACC	✓
Resistance	✗	✗	✗
Temperature (PTx)	DSI-RTD	DSI-RTD	✗
Thermocouple	DSI-TH	DSI-TH	✗
Potentiometer	✓	✗	✗
LVDT	DSI-LVDT	DSI-LVDT	✗
Charge	DSI-CHG	DSI-CHG	✗
Current	ext. shunt, DSI	ext. shunt, DSI	ext. shunt
TEDS	✓	✓	✓
Isolation voltage	500 V in pairs	500 V in pairs	500 V in pairs
Power consumption per channel	1.3 W/pair	1.3 W/pair	1.3 W/pair
Advanced functions	Low power, sensor and amplifier balance	High sensor power and multi range	Sensor error detection

Warning

Be careful with voltages >25 VAC or >35 VDC! These voltages are already high enough in order to get a perilous electric shock by touching the wiring.

5.6. SIRIUS® Waterproof specifications

	SIRIUSiwe-6xSTGM-2xSTGM+	SIRIUSwe-HD-16xSTGS	SIRIUSiwe-6xLV-2xLV+
Analog inputs			
Analog inputs	8 ch voltage Full / half / quarter bridge strain	16 ch voltage Full / half / quarter bridge strain	8 ch voltage Full bridge strain, current (ext. Shunt)
ADC type	2x 24-bit delta-sigma DUALCOREADC® with anti-aliasing filter	24-bit delta-sigma with anti-aliasing filter	2x 24-bit delta-sigma DUALCOREADC® with anti-aliasing filter
Sampling rate on USB	Simultaneous 200 kS/sec	Simultaneous 200 kS/sec	Simultaneous 200 kS/sec
Sampling rate on EtherCAT®	Simultaneous 20 kS/sec	Simultaneous 10 kS/sec	Simultaneous 20 kS/sec
Ranges	±10 V, ±1 V, ±100 mV, ±10 mV	±10 V, ±1 V, ±100 mV, ±10 mV	±200 V, ±10 V, ±1 V, ±100 mV
Bridge ranges	2 mV/V ... 1000 mV/V, free programmable	2 mV/V ... 1000 mV/V, free programmable	2 mV/V ... 1000 mV/V, free programmable
Dynamic Range@10kS	-152 dB	-137 dB	-152 dB
Input coupling	DC	DC	DC, AC 1 Hz (3 Hz, 10 Hz per SW)
Input impedance	10 MΩ	10 MΩ	200 V Range: 1 MΩ; all other ranges 10 MΩ between IN+ or In- against GND
Bridge modes	Full / Half / Quarter Br 120 / 350 Ω 3-wire; internal bridge completion	Full / Half / Quarter Br 120 / 350 Ω 3-wire; internal bridge completion	Full
Internal shunt resistor	100 kΩ (others on request), Sns+ or Sns- to In+ or In-	100 kΩ (others on request), Sns+ to In+ or In-	✗
Excitation voltage	0 - 15 VDC bipolar software programmable (16-bit DAC), max 44 mA	0 - 12 VDC bipolar software programmable (16-bit DAC), max 44 mA	0 - 24 V DC unipolar 2 - 30 V DC bipolar software programmable (16-bit DAC), max 200 mA / 2 W
Temperature derating	✗	✗	-40 °C ... 40 °C : ✗ 40 °C ... 60 °C : linear from total 8W Exc power to 1W Exc power
TEDS	Supported, DSI® adapters	Supported, DSI® adapters	Supported, DSI® adapters
Overvoltage protection	IN+ to IN-: 50 V continuous; 200 V peak (10 msec)	IN+ to IN-: 50 V continuous; 200 V peak (10 msec)	200 V Range: 300 V; all other ranges: 100 V (250 V peak for 10 msec)
Counter inputs	2x Supercounter® (6 Digital In, 2 Digital out)	✗	2x Supercounter® (6 Digital In, 2 Digital out)
Isolation Voltage	1000 V channel-channel, channel-ground	Differential (ground loop isolated)	1000 V channel-channel, channel-ground
Input connectors	DSUB-9 CNT: 7-pin LEMO female	DSUB-9	DSUB-9 CNT: 7-pin LEMO female
Power			
Power supply	9 - 36 V DC	9 - 36 V DC	9 - 36 V DC
Power consumption	Typ. 11 W (Max. 20 W)	Typ. 14 W (Max. 24 W)	Typ. 14 W (Max. 42 W, temperature derating applies)

Environmental			
Operating Temperature	-40 °C … 60 °C	-40 °C … 50 °C	-40 °C … 60 °C
Storage Temperature	-40 °C … 85 °C	-40 °C … 85 °C	-40 °C … 85 °C
Humidity	5 to 100 % RH	5 to 100 % RH	5 to 100 % RH
IP rating	IP65 / IP67	IP65 / IP67	IP65 / IP67
Shock	60 g @ 6 ms 50x, half sine, all axis 100 g @ 4 ms 50x, half sine, all axis	60 g @ 6 ms 50x, half sine, all axis 100 g @ 4 ms 50x, half sine, all axis	60 g @ 6 ms 50x, half sine, all axis 100 g @ 4 ms 50x, half sine, all axis
Vibration	Random: Profile breakpoints: 24 Hz - 0.023 g²/Hz 60 Hz - 0.28 g²/Hz 100 Hz - 0.28 g²/Hz 240 Hz - 0.056 g²/Hz 2 kHz - 0.056 g²/Hz Profile RMS / Peak = 11.5 g / 34.5 g (up to 15 / 45 g with absorbers) 6 hrs in each axis, 18 hrs total	Random: Profile breakpoints: 24 Hz - 0.023 g²/Hz 60 Hz - 0.28 g²/Hz 100 Hz - 0.28 g²/Hz 240 Hz - 0.056 g²/Hz 2 kHz - 0.056 g²/Hz Profile RMS / Peak = 11.5 g / 34.5 g (up to 15 / 45 g with absorbers) 6 hrs in each axis, 18 hrs total	Random: Profile breakpoints: 24 Hz - 0.023 g²/Hz 60 Hz - 0.28 g²/Hz 100 Hz - 0.28 g²/Hz 240 Hz - 0.056 g²/Hz 2 kHz - 0.056 g²/Hz Profile RMS / Peak = 11.5 g / 34.5 g (up to 15 / 45 g with absorbers) 6 hrs in each axis, 18 hrs total
Physical			

Important

See corresponding specifications of amplifier modules for more details.

5.7. General specification

The general specifications apply to all SIRIUS® measurement slices unless otherwise noted at the specific measurement slice.

Power	
Power Supply	9 - 36 V DC
Power consumption	Typ. 15 - 35 W
Environmental	
Operating Temperature	-10 to 50 °C (40 °C for fanless series)
Storage Temperature	-40 to 85 °C
Humidity	5 to 95 % RH non condensing @ 60 °C
IP rating	IP20 (IP50 for fanless series)
Shock & Vibration	Vibration sweep sinus (EN 60068-2-6:2008) Vibration random (EN 60721-3-2: 1997 - Class 2M2) Shock (EN 60068-2-27:2009) MIL-STD-810D
EMC	EN 61326-1, EN 61000-3-2, EN61000-3-3
Acquisition rate	
Time base accuracy	Typical 5 ppm, Max: 20 ppm
Synchronisation	
Delay between slices	50 nsec
Max. Sync-cable length	100 m (Master/Slave), 200 m (IRIG)
EtherCAT®: Max. cable length	100 m
Sync Input / Output	
Level (Input/Output)	TTL compatible
Max. Output Current	±24 mA (±50 mA for 1 sec)

5.7.1. General counter specifications

Counter	
Modes	Counting, waveform timing, encoder, tacho, geartooth sensor
Counter timebase	102.4 MHz
Time base accuracy	Typical: 5 ppm, Max: 20 ppm
Max. Bandwidth	10 MHz
Input Filter	500 ns, 1 μs, 2 μs, 4 μs, 5 μs and 7.5 μs
Counter resolution	32-bit
Input Compatibility, Level	TTL/CMOS (Low: <0.8 V, High >2 V)
Input termination, impedance	100 kΩ pull-up to +3.3 V
Input Protection	±25 V continuous
Alarm output	Open collector, max. 100 mA / 30 V
Sensor supply	5 V / 100 mA; 12 V / 50 mA

! **Warning**

Be careful with voltages >25 VAC or >35 VDC! These voltages are already high enough in order to get a perilous electric shock by touching the wiring.

Caution

GND of the counter input is connected to the GND of the analog channel.

Caution

For ACC+, CHG+ channels GND of the counter input is connected via a 50 Ω resistor to In- of the analog channel.

5.7.2. HS general specifications

ADC	
Type	16-bit SAR
Sampling Rate	Simultaneous 1 MS/sec
Analog anti alias filter	Bypass or analog 100 kHz 5th order Bessel
Digital low pass filter	**Software selectable**
Digital filter Characteristic	Bypass, Butterworth or Bessel
Filter Order	2nd , 4th, 6th or 8th
Ratio Sample rate to Filter Freq.	From 2 to 100
Topology	Cascaded IIR Filter (up to 4 sections)

5.7.3. Low-pass filters on Sirius HS

1. The **100 kHz filter** is a hardware filter and is always applied except for when the "Off" option is selected in the dropdown menu.
    This hardware filter is a Bessel 5th order filter.
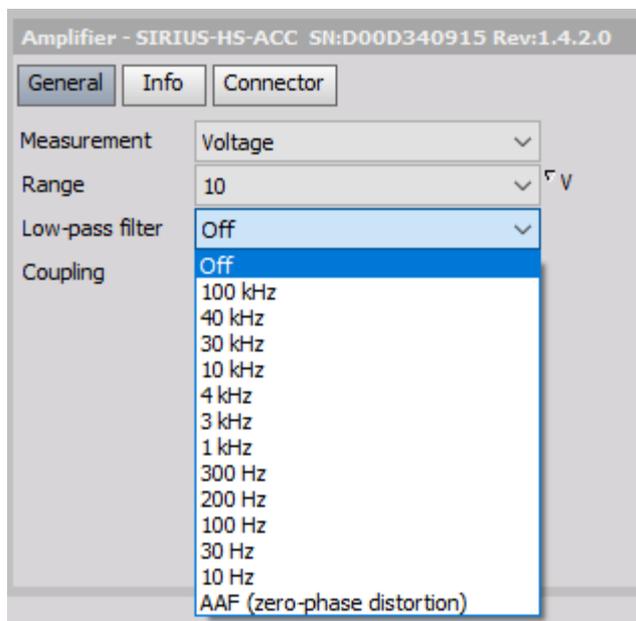
2. IIR filters **between 40 and 1 kHz** are firmware filters, which means, that they are calculated on the FPGA.
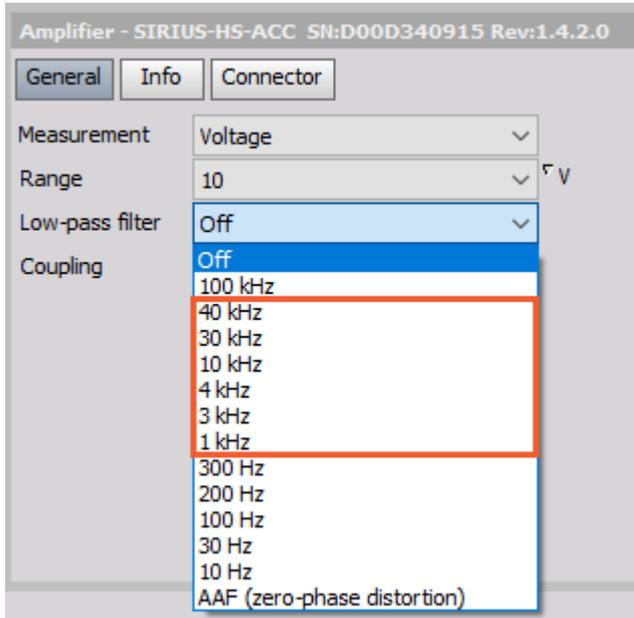
3. IIR filters with cut-off frequencies **lower than 1 kHz** are Software filters. If one of these filters is selected in the dropdown menu, then in addition to the software filter, with the selected cut-off frequency, a firmware filter with 1 kHz cut-off frequency is applied (the type and order of this filter is the same as the software one).
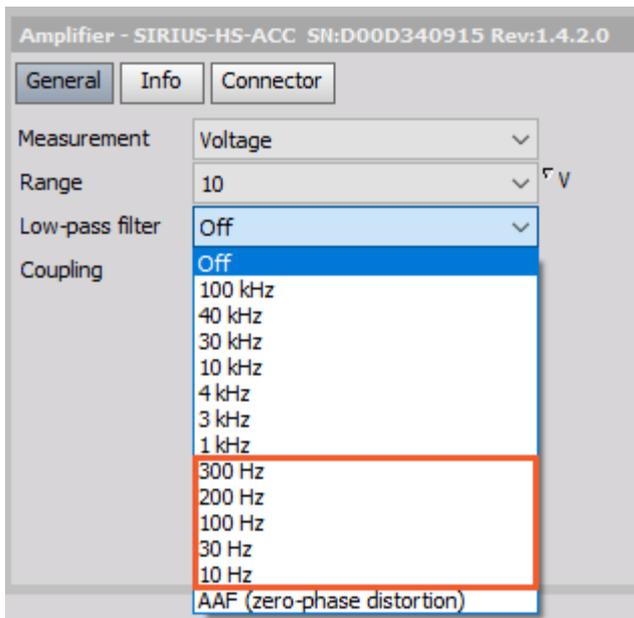
4. **AAF (zero-phase distortion)** has a cut-off frequency of 80 kHz, if the channel sample rate is equal or above 160 kHz. When a lower sample rate is selected , then the cut-off frequency of the AAF is equal to half the sampling rate of that channel.
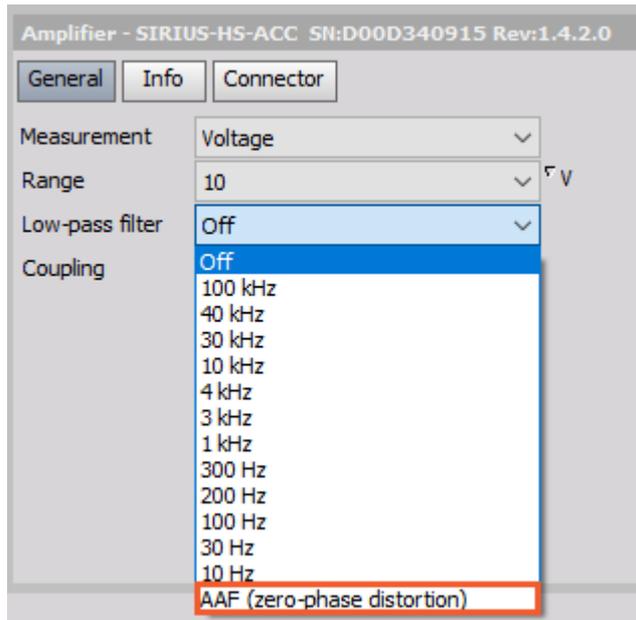
5. **Special case:** If on a channel, that has a sample rate divider, a IIR filter is applied whose cut-off frequency is greater then 0.4 times the channels sampling rate, then in addition to the selected IIR filter a filter with a cut-off frequency at 0.4 times the sampling rate of the channel is also applied to the filter chain.

5.7.4. General connection diagrams

In illustration below "*Typical connection diagrams*" parts of the measurement chain are shown:
- Amplifier
- Connections
- Sensor
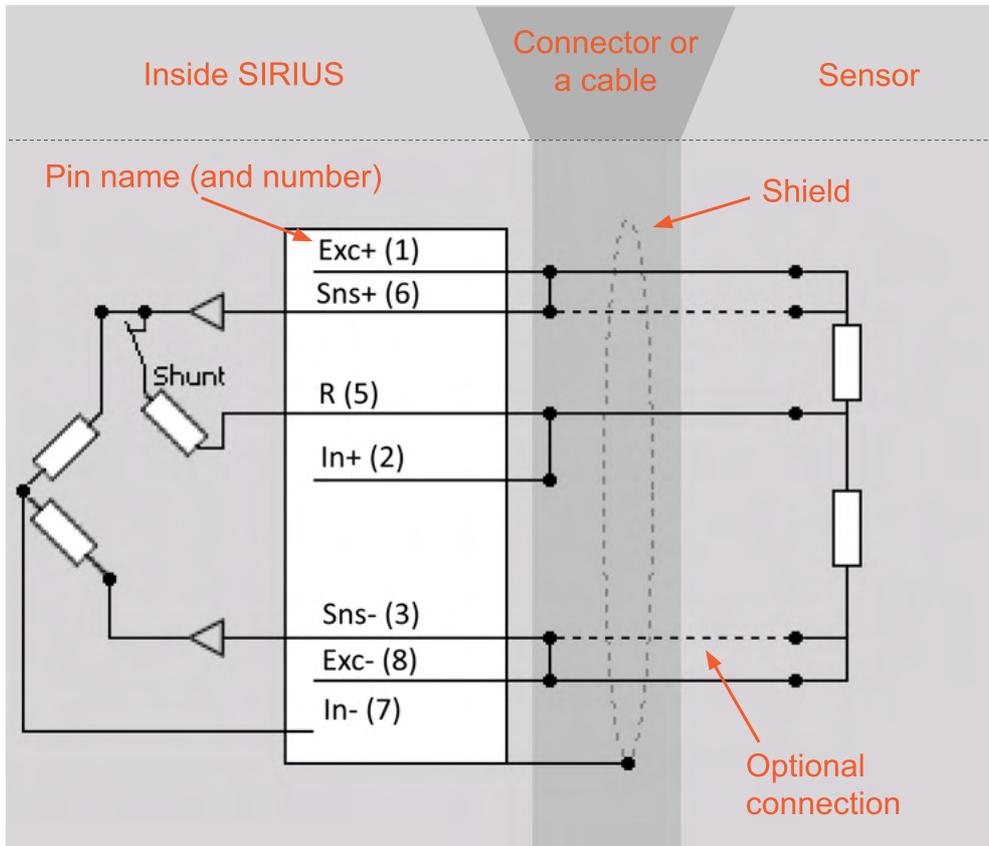
Typical connection diagrams

5.8. ACC / ACC+

The ACC modules are perfect for sound and vibration IEPE channels.

5.8.1. ACCv2: Specifications

Inputs		
Input types	Voltage IEPE	
ADC Type	24-bit delta-sigma dual core with anti-aliasing filter	
Sampling Rate	Simultaneous 200 kS/sec	
Ranges (Dual Core Low Range)	**±10 V (±500 mV)**	**±500 mV (NA)**
Input Accuracy (Dual Core)	±0.1 % of reading ±10 (1) mV	±0.1 % of reading ±1 (NA) mV
Dynamic Range @ 10 kS (Dual Core)	-140 dB (-160 dB)	-135 dB (NA)
Typ. Noise floor @ 50 kS (Dual Core)	-107 dB (-125 dB)	-100 dB (NA)
Typ. CMR @ 50 Hz / 1 kHz	140 / 120 dB	140 / 120 dB
Gain Drift	Typical 10 ppm/K, max. 30 ppm/K	
Offset Drift	Typical 0.5 µV/K + 2 ppm of range/K, max 2 µV/K + 10 ppm of range/K	
Gain Linearity	<0.02 %	
Inter Channel Phase-mismatch	0.02° * fin [kHz] + 0.1° (@ 200 kS/sec)	
Channel Crosstalk	<-160 dB @ 1 kHz	
Input Coupling	DC, AC 0.1 Hz,1 Hz	
Input Impedance	1 MΩ (270 kΩ for AC coupling ≥1 Hz) in parallel with 100 pF	
Overvoltage Protection	In+ to In-: 50 V continuous; 200 V peak (10 msec)	
IEPE mode		
Excitation	2, 4, 8, 12, 16 or 20 mA	
Compliance voltage	25 Volt	
Output Impedance	>100 kΩ	
Sensor detection	Shortcut: <4 Volt; Open: >19 Volt	
Counters (ACC+ type only)		
Inputs	1 digital counter input 3 digital inputs Fully synchronised with analog data	
Counter Modes	counting, waveform timing, encoder, tacho, gear-tooth sensor	
General Counter Specifications	See "SIRIUS counter specifications"	
Additional Specifications		
Input connector BNC	BNC or TNC (others on request)	
TEDS support	IEPE mode only	

5.8.2. ACC
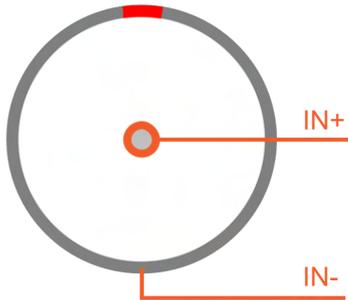
SIRIUSi-8xACC

ACC connector: pin-out (BNC)

5.8.2.1. ACC: Voltage, IEPE

Voltage

IEPE
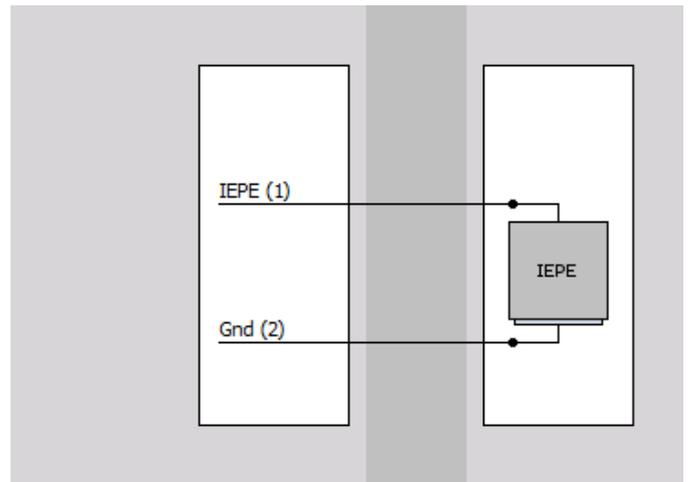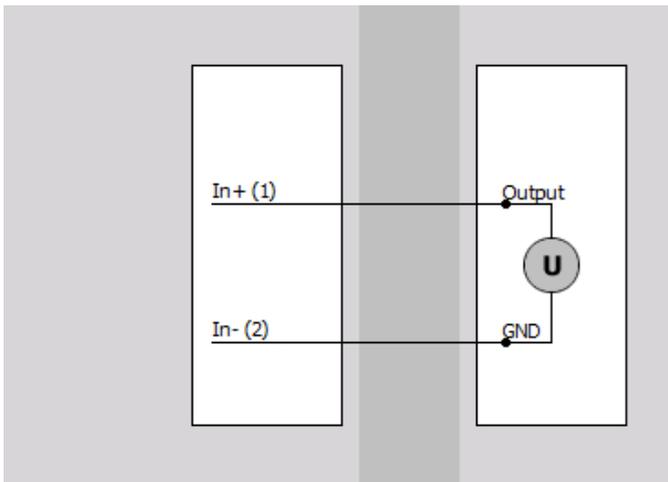
5.8.3. ACC+ (Counter)

As an additional function to the ACC module, the ACC+ module also has a 7-pin LEMO connector for digital counters.

CNT connector: pin-out (7-pin LEMO)

SIRIUSi-8xACC+

Connector type L1B7f

Connector on the module: EGG.1B.307.CLL
Mating cable connector: FGG.1B.307.CLAD52

> **Caution**
> GND of the counter input is connected via a 50 Ω resistor to In- of the analog channel.

Digital output configuration

The "switch" of the open collector output is closed when active.

5.9. MIC200

The SIRIUS-8xMIC200 device has 8 isolated channels whose usage is intended for externally polarized microphones requiring 200V polarization voltage.

5.9.1. MIC200: Specifications

Inputs		
Input types	Voltage (Externally polarized microphones)	
ADC Type	24-bit delta-sigma dual core with anti-aliasing filter	
Sampling Rate	Simultaneous 200 kS/sec	
Dual Core Ranges (Dual Core)	**±10 V (±500 mV)**	**±500 mV (NA)**
Input Accuracy @ 1 kHz	±0.1 % of reading	±0.1 % of reading
Dynamic Range @ 10 kS/s (Dual Core)	-139 dB (-160 dB)	-134 dB (NA)
Typ. Noise floor @ 50 kS/s (Dual Core)	-109 dB (-125 dB)	-100 dB (NA)
Typ. THD @ 200 kS/s (Signal: -1 dBFS @ 1 kHz)	-94 dB	-92 dB
Typ. SFDR @ 200 kS/s (Signal: -1 dBFS @ 1 kHz)	97 dB	93 dB
Typ. CMR @ 50 Hz / 400 Hz / 1 kHz	140 / 133 / 126 dB	140 / 133 / 126 dB
Gain Drift	typ. 10 ppm/K, max. 40 ppm/K	
Gain Linearity	<0.03 %	
Input Coupling	AC 0.35 Hz (3 Hz, 10 Hz per SW)	
Excitation		
Preamplifier Excitation Voltage	±14 V	
Polarization Voltage	200 V	
Polarization Voltage Accuracy	±0.5 %	
Protection	Continuous short to ground	
Additional Specifications		
Input connector	7-pin LEMO 1B	
TEDS support	Standard (Class 2)	

5.9.2. MIC200-L1B7f

SIRIUSi-8xMIC200

MIC200 connector: pin-out (7-pin LEMO)

Connector type L1B7f
Connector on the module: EGG.1B.307.CLL
Mating cable connector: FGG.1B.307.CLAD5
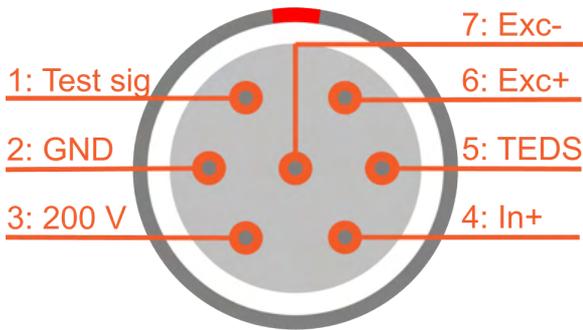
Pin	Name	Description
1	NC	Do not connect
2	GND	Signal Ground
3	200 V	Polarization Voltage 200V
4	In+	Signal Input
5	TEDS	TEDS
6	Exc+	Exc +
7	Exc-	Exc -

5.9.2.1. MIC200: Voltage
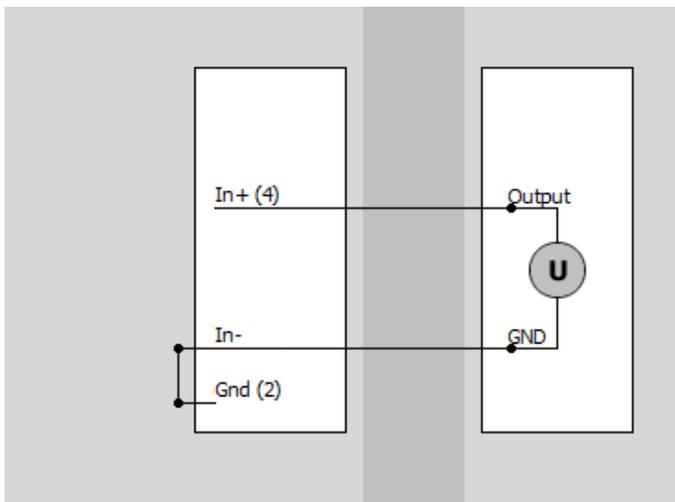
5.10. CHG / CHG+

The CHG modules are perfect for charge measurements and also sound and vibration IEPE channels.

5.10.1. CHG: Specifications

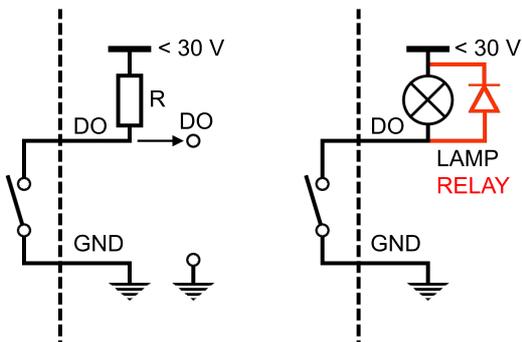| Inputs		
Input types	Voltage IEPE Charge	
ADC Type	24-bit delta-sigma dual core with anti-aliasing filter	
Sampling Rate	Simultaneous 200 kS/sec	
Ranges (Dual Core Low Range)	**±10 V (500 mV)**	**±500 mV (NA)**
Input Accuracy (Dual Core)	±0.05 % of reading ±5 (0.5) mV	±0.05 % of reading ±0.5 mV
Typ. Dynamic Range @ 10kS (Dual Core)	-140 dB (-155 dB)	-130 dB (NA)
Typ. Noise floor @ 50 kS (Dual Core)	-107 dB (-124 dB)	-98 dB (NA)
Typ. CMR @ 50 Hz / 1 kHz	140 dB / 120 dB	140 dB / 120 dB
Gain Drift	Typical 10 ppm/K, max. 30 ppm/K	
Offset Drift	Typical 1 µV/K + 5 ppm of range/K, max 5 µV/K + 10 ppm of range/K	
Gain Linearity	<0.02 %	
Inter Channel Phase-mismatch	0.02° * fin [kHz] + 0.1° (@ 200 kS/sec)	
Channel Crosstalk	-180 dB @ 50 Hz; -160 dB @ 1 kHz	
Input Coupling	DC, AC (0.1 Hz, 1 Hz, 10 Hz or 100 Hz)	
Input Impedance	1 MΩ in parallel with 100 pF	
Overvoltage Protection	In+ to In-: 50 V continuous; 200 V peak (10 msec)	
IEPE mode		
Excitation	4, 8 or 12 mA	
Compliance voltage	25 Volt	
Output Impedance	>100 kΩ	
Sensor detection	Shortcut: <4 Volt; Open: >19 Volt	
Charge ranges (Low Range)	**±100 000 pC (5000 pC)**	**±10 000 pC (500 pC)**
Input accuracy (HPF 0.1 Hz)	±0.5 % of reading ±20 pC	±0.5 % of reading ±5 pC
Typ. Dynamic Range @ 10 kS (Dual Core)	-130 dB (-150 dB)	-120 dB (-140 dB)
Typ. Noise floor @ 50 kS (Dual Core)	107 dB (120 dB)	105 dB (118 dB)
Input coupling	0.01 Hz, 0.03 Hz, 0.1 Hz, 0.5 Hz, 1 Hz, 10 Hz or 100 Hz	
Charge injection	1 Vrms, 20 Hz, 0.5 % accuracy	
Counters (only in CHG+ type)		
Inputs	1 digital counter input 3 digital inputs Fully synchronised with analog data	
Counter modes	counting, waveform timing, encoder, tacho, gear-tooth sensor	
General counter specifications	See "SIRIUS counter specifications"	
Additional specifications		
Input connector	BNC or TNC (others on request)	
TEDS support	IEPE mode only	

5.10.2. CHG
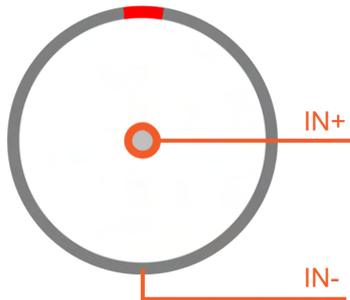
CHG connector: pin-out (BNC)

SIRIUSi-8xCHG

5.10.2.1. CHG: Voltage, IEPE, Charge
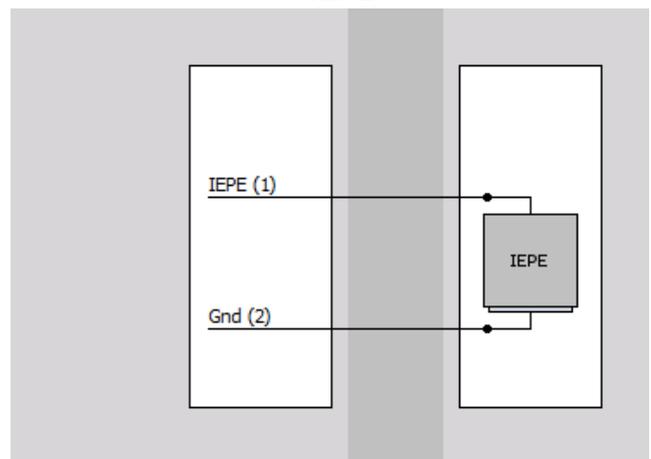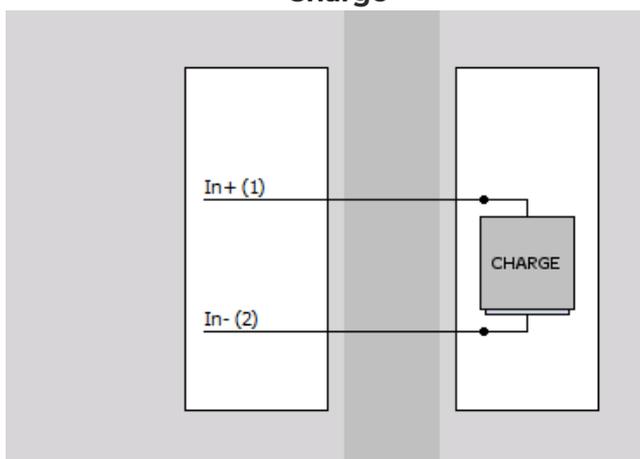
Voltage

IEPE

Charge

5.10.3. CHG+ (Counter)
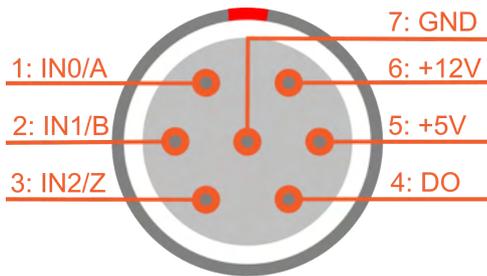
1: IN0/A
2: IN1/B
3: IN2/Z
7: GND
6: +12V
5: +5V
4: DO

CNT connector: pin-out (7-pin LEMO)

SIRIUSi-8xCHG+

Connector type L1B7f
Connector on the module: EGG.1B.307.CLL
Mating cable connector: FGG.1B.307.CLAD52

Caution

GND of the counter input is connected via a 50 Ω resistor to In- of the analog channel.

Digital output configuration

The "switch" of the open collector output is closed when active.

< 30 V
R
DO   DO
GND

< 30 V
DO
LAMP
RELAY
GND
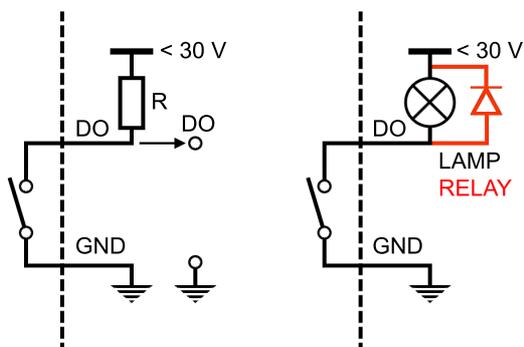
5.11. HV

The HV modules are perfect for high voltage measurements.

5.11.1. HVv2 Specifications

Inputs Voltage		
ADC Type	24-bit delta-sigma dual core with anti-aliasing filter	
Sampling Rate	Simultaneous 200 kS/sec	
Ranges (Dual Core Low Range)	**±1200 V (±50 V)**	**±50 V (NA)**
Gain accuracy	±0.05 % of reading	
Offset accuracy (Dual Core)	±100 (50) mV	±50 mV
Typ. Dynamic Range @ 10 kS (Dual Core)	-142 dB (-158 dB)	-132 dB (NA)
Typ. Noise floor @ 50 kS (Dual Core)	-107 dB (-120 dB)	-95 dB (NA)
Typ. CMR @ 50 Hz / 1 kHz	85 / 60 dB	85 / 60 dB
Gain Drift	Typical 5 ppm/K, max. 30 ppm/K	
Offset Drift	Typical 1 mV/K + 1 ppm of range/K, max 2 mV/K + 5 ppm of range/K	
Gain Linearity	<0.02 %	
Inter Channel Phase-mismatch	0.04° * fin [kHz] + 0.2° (@ 200 kS/sec)	
Channel Crosstalk	-115 dB @ 50 Hz; -90 dB @ 1 kHz	
Input Coupling	DC	
Input Impedance	10 MΩ || 2 pF	
Overvoltage category	CAT II 1000 V	
Maximum input voltage	2000 V dc or acrms	
Additional Specifications		
Input connector	Banana	
TEDS support	Not available	

5.11.2. HV
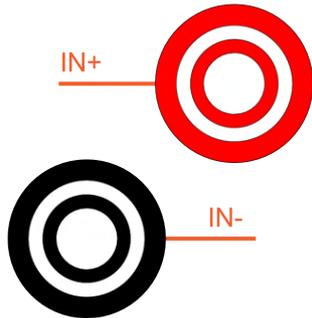
HV connector: pin-out (Banana plug)

SIRIUSi-8xHV-BAN

> ⚠ **Warning**
>
> It is mandatory to connect a ground cable to the GND connector of the SIRIUS® when you are working with high voltages.

5.11.2.1. HV: Voltage
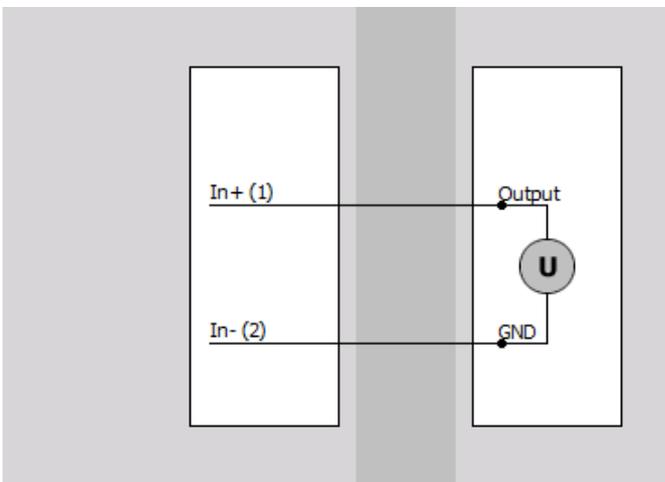
5.12. LV / LV+

The LV modules are perfect for low voltage and current measurements in combination with current clamps.

5.12.1. LVv2: Specifications

Inputs				
Input types	Voltage Full bridge strain Current (ext. Shunt)			
ADC Type	24-bit delta-sigma dual core with anti-aliasing filter			
Sampling Rate	Simultaneous 200 kS/sec			
Dual Core Ranges (Low Range)	**±200 V (10 V)**	**±10 V (500 mV)**	**±1 V (50 mV)**	**±100 mV (5 mV)**
Gain accuracy	±0.05 % of reading			
Offset accuracy (Dual Core)	±40 (20) mV	±2 (1) mV	±0.2 (0.2) mV	±0.1 (0.1) mV
Offset accuracy after Balance Amplifier	2 mV	0.1 mV	0.02 mV	0.01 mV
Typ. Dynamic Range @ 10 kS (Dual Core)	-136 dB (-146 dB)	-137 dB (-152 dB)	-137 dB (-147 dB)	-130 dB (-132 dB)
Typ. Noise floor @ 10 kS (Dual Core)	-109 dB (-118 dB)	-109 dB (-126 dB)	-109 dB (-116 dB)	-97 dB (-97 dB)
Typ. CMR @ 50 Hz / 400 Hz / 1 kHz / 10 kHz	70 / 70 / 60 / 55 dB	95 / 95 / 89 / 84 dB	105 / 105 / 100 / 95 dB	115 / 112 / 107 / 102 dB
Gain Drift	Typical 10 ppm/K, max. 30 ppm/K			
Offset Drift	Typical 0.3 µV/K + 5 ppm of range/K, max: 2 µV/k + 10 ppm of range/K			
Gain Linearity	<0.02 %			
Inter Channel Phase-mismatch	0.02° * fin [kHz] + 0.1° (@ 200 kS/sec and 10 V range)			
Channel Crosstalk	-120 dB @ 10 kHz (range ≤10 V); -95 dB @ 10 kHz (range = 100 V)			
Input Coupling (see 1)	DC, AC 1 Hz (3 Hz, 10 Hz per SW)			
Input Impedance	200 V Range: 1 MΩ; all other ranges 10 MΩ between IN+ or IN- against GND			
Max. common mode voltage	Isolated version ±500 V Differential version: 200 V range: ±200 V; all other Ranges: ±12 V			
Overvoltage Protection	200 V Range: 300 V; all other ranges: 100 V (250 V peak for 10 msec)			
Excitation Voltage				
Excitation voltage	Unipolar or Bipolar Software selectable (programmable with 16-bit DAC)			
Excitation Level unipolar	0...24 Volt; Predefined levels: 1, 2.5, 5, 10, 12, 15 and 24 VDC			
Excitation Level bipolar	2...30 Volt; Predefined levels: 2.5, 5, 10, 12, 15, 24 and 30 VDC			
Accuracy	±0.1 % ±5 mV			
Drift	±50 ppm/K ±100 µV/K			
Stability	10 % to 90 % load (bipolar) <0.01 %			
Current limit	200 mA (2 Watt max. per channel, 12 Watt max. per Slice)			
Protection	Continuous short to ground			

Bridge connection types	
Bridge type	Full bridge
Ranges @ 10 Vexc(low range)	2 mV/V...1000 mV/V free programmable with Dual Core
Input short, Sensor offset adjust	Software selectable
Counters (only on LV+ type)	
Inputs	1 digital counter input 3 digital inputs Fully synchronised with analog data Alarm output
Counter modes	Counting, waveform timing, encoder, tacho, gear-tooth sensor
General Counter Specifications	See "SIRIUS counter specifications"
Additional Specifications	
Misc function	Excitation control monitoring, Amplifier Short, Single Ended/Differential
Input connector	DSUB-9, BNC, Banana (others on request)
TEDS support	Standard + DSI® adapters

5.12.2. LV

1: Exc+
2: In+
3: Sns-
4: GND
5: DI status
6: Sns+
7: In-
8: Exc-
9: TEDS
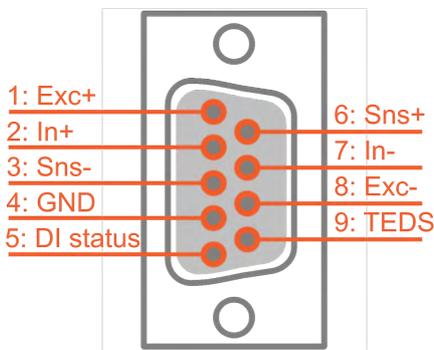
LV connector: pin-out (DSUB-9 female)

SIRIUSi-8xLV

Important

Digital status input

Pin 5: DI Status is used for digital status input: i.e. show alarm status in DewesoftX® when a current clamp is open. See "Accessories and Sensors Technical Reference Manual"!

5.12.2.1. LV: Voltage

Voltage - Single ended
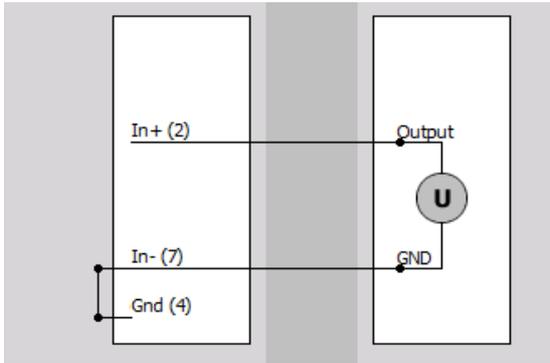
Voltage – Differential
Use only when sensor Output (+) and Output (-) are referenced to Gnd. Gnd must be connected.
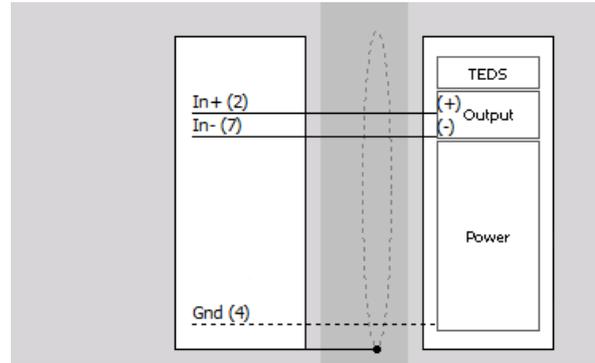
5.12.2.2. LV: Current

External direct shunt
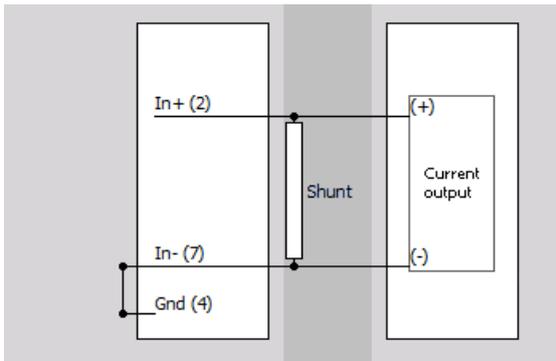
External loop powered shunt
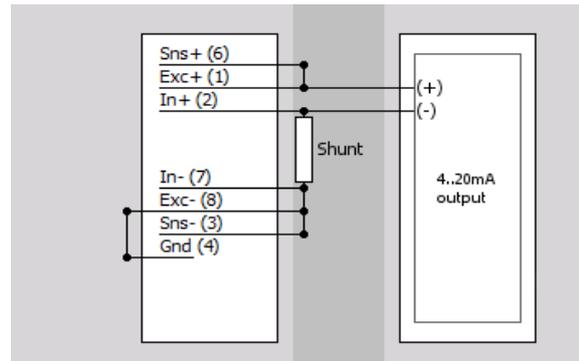
5.12.2.3. LV: Bridge

Full Bridge
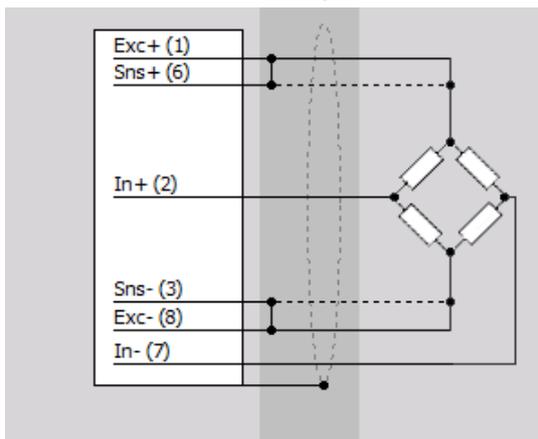
5.12.2.3.1. LV: Bridge

Bridge range	Set excitation	Accuracy
2 mV/V	2 V	0.074 % of reading + 50 uV/V
20 mV/V	2 V	0.22 % of reading + 50 uV/V
200 mV/V	2 V	0.32 % of reading + 100 uV/V
1000 mV/V	2 V	0.32 % of reading + 500 uV/V
2 mV/V	2.5 V	0.072 % of reading + 40 uV/V
20 mV/V	2.5 V	0.2 % of reading + 40 uV/V
200 mV/V	2.5 V	0.28 % of reading + 80 uV/V
1000 mV/V	2.5 V	0.28 % of reading + 400 uV/V
2 mV/V	5 V	0.069 % of reading + 20 uV/V
20 mV/V	5 V	0.15 % of reading + 20 uV/V
200 mV/V	5 V	0.2 % of reading + 40 uV/V
1000 mV/V	5 V	0.2 % of reading + 200 uV/V
2 mV/V	10 V	0.071 % of reading + 10 uV/V
20 mV/V	10 V	0.12 % of reading + 20 uV/V
200 mV/V	10 V	0.13 % of reading + 100 uV/V
1000 mV/V	10 V	0.16 % of reading + 100 uV/V
2 mV/V	15 V	0.073 % of reading + 6.7 uV/V
20 mV/V	15 V	0.12 % of reading + 14 uV/V
200 mV/V	15 V	0.13 % of reading + 67 uV/V
1000 mV/V	15 V	0.14 % of reading + 67 uV/V
2 mV/V	20 V	0.075 % of reading + 5.0 uV/V
20 mV/V	20 V	0.11 % of reading + 10 uV/V
200 mV/V	20 V	0.13 % of reading + 50 uV/V
1000 mV/V	20 V	0.14 % of reading + 50 uV/V

5.12.3. LV-BAN
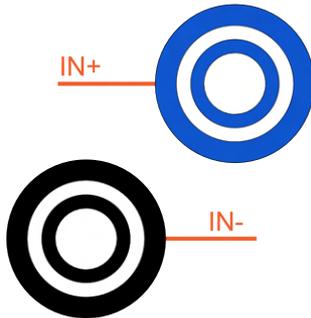
SIRIUSi-8xLV-BAN

LV connector: pin-out (Banana plug)

5.12.3.1. LV-BAN: Voltage, Current
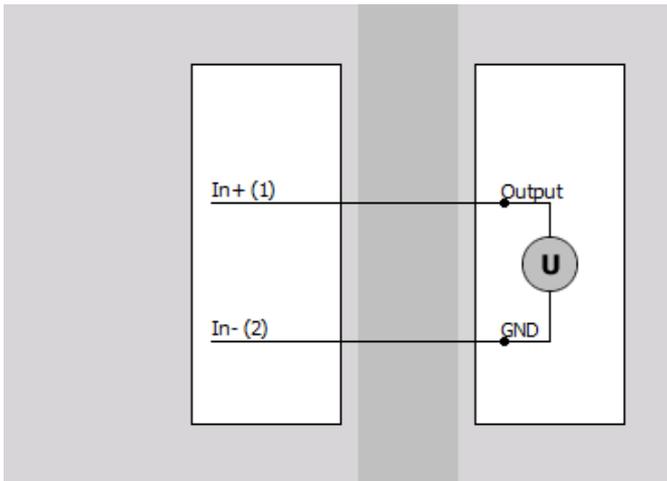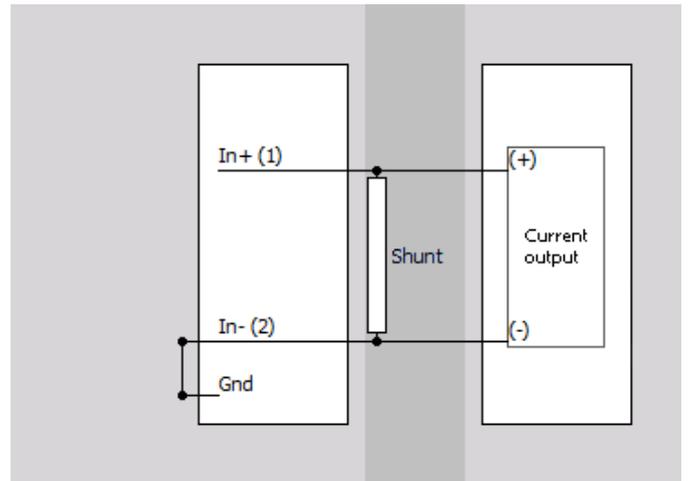
Voltage

Current

5.12.4. LV-BNC

LV-BNC connector: pin-out (BNC)

SIRIUSi-8xLV-BNC

5.12.4.1. LV-BNC: Voltage, Current
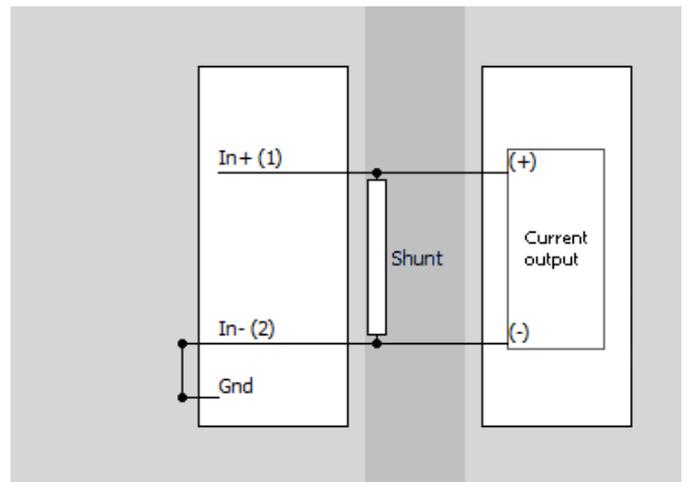
Voltage

Current

5.12.5. LV+ (Counter)

As an additional function to the ACC module, the ACC+ module also has a 7-pin Lemo connector for digital counters

7: GND
1: IN0/A   6: +12V
2: IN1/B   5: +5V
3: IN2/Z   4: DO
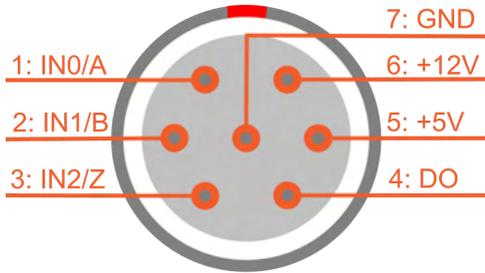
CNT connector: pin-out (7-pin LEMO female)

SIRIUSi-8xLV+

Connector type L1B7f
Connector on the module: EGG.1B.307.CLL
Mating cable connector: FGG.1B.307.CLAD52

⚠ Caution
GND of the counter input is connected to the GND of the analog channel.

Digital output configuration
The "switch" of the open collector output is closed when active.

5.13. MULTI

The MULTI modules are perfect for multi-purpose analog in/out and digital/counters.

5.13.1. MULTI: Specifications

Inputs				
Input types	Voltage Full / Half / Quarter bridge strain (120 Ω and 350 Ω)			
ADC Type	24-bit delta-sigma dual core with anti-aliasing filter			
Sampling Rate	Simultaneous 200 kS/sec			
Dual Core Ranges (Low range)	**±10 V (±500 mV)**	**±1 V (50 mV)**	**±100 mV (±5 mV)**	**±50 mV (±2.5 mV)**
Gain accuracy	±0.05 % of reading			
Offset accuracy (Dual Core)	±10 (5) mV	±1 (0.5) mV	±0.2 (0.2) mV	±0.2 (0.2) mV
Offset accuracy after Balance Amplifier	0.2 mV	0.02 mV	0.02 mV	0.02 mV
Typ. Dynamic Range @ 10 kS (Dual Core)	-137 dB (-152 dB)	-137 dB (-147 dB)	-135 dB (-137 dB)	-133 dB (-133 dB)
Typ. Noise floor @ 10 kS (Dual Core)	-105 dB (-121 dB)	-104 dB (-111 dB)	-100 dB (-101 dB)	-95 dB (-95 dB)
Typ. CMR @ 400 Hz / 1 kHz	86 / 84 dB	96 / 95 dB	112 / 102 dB	112 / 102 dB
Gain Drift	Typical 10 ppm/K, max. 40 ppm/K			
Offset Drift	Typical 0.3 µV/K + 5 ppm of range/K, max 2 µV/K + 10 ppm of range/K			
Gain Linearity	<0.02 %			
Inter Channel Phase-mismatch	0.02° * fin [kHz] + 0.1° (@ 200 kS/sec)			
Channel Crosstalk	-120 dB @ 10 kHz			
Input Coupling	DC			
Input Impedance	10 MΩ			
Max. Common Mode Voltage	Isolated version: ±500 V Differential version: ±12 V			
Overvoltage Protection	In+ to In-: 50 V continuous; 200 V peak (10 msec)			
Excitation Voltage				
Excitation Voltage	Free programmable (16-bit DAC)			
Predefined levels	0, 1, 2.5, 5, 10 and 12 VDC			
Accuracy	±0.1 % ±10 mV			
Drift	±50 ppm/K ±100 µV/K			
Load stability	0 % to 100 % load <0.01 %			
Current limit	45 mA (max. 400 mW)			
Protection	Continuous short to ground			
Additional Fixed Excitations	DSUB-15: 12 V (max. 50 mA); 5 V (max. 100 mA) Accuracy 5 % 16-pin LEMO-2B: +/- 14.5 V (max. 50 mA); 5 V (max. 100 mA) Accuracy 5 %			
Bridge Connection Types				
Bridge Types	Full / Half / Quarter bridge (3-wire)			

Ranges	2 mV/V...1000 mV/V free programmable with Dual Core
Internal Bridge Completion	½ bridge 1 kΩ and ¼ bridge 120 Ω and 350 Ω
Typ. Bridge Completion Accuracy	0.05 %; TCR: 5 ppm/K (others on request)
Internal Shunt Resistor	59.88 kΩ, software selectable (others on request)
Typ. Shunt Resistor Accuracy	0.05 %; TCR: 10 ppm/K (others on request)
Input Short, Sensor Offset Adjust	Software selectable
Counters	
Inputs	1 digital counter input 3 digital inputs Fully synchronised with analog data
Counter Modes	counting, waveform timing, encoder, tacho, gear-tooth sensor
Input Level Compatibility	CMOS, LVTTL (protected up to ±25 Volt continuous)
FRONT Analogue Out	**1 channel, 24-bit sigma delta 200 kHz, ±10 V**
Accuracy	±0.1 % of reading ±0.02 V
Temperature Drift	±50 ppm/K of reading ± 200 µV/K
Output Impedance	<10 Ω
Maximum Output Current / Load	20 mA / >1000 Ω
Output Protection	Continuous short to ground
Additional Specifications	
Input connector	DSUB-15, 16-pin LEMO-2B (others on request)
TEDS support	Standard + DSI® adapters

5.13.2. MULTI

SIRIUSi-8xMULTI
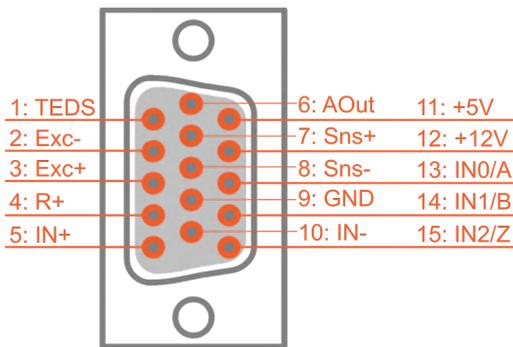
MULTI connector: pin-out (DSUB-15)

Pin	Name	Description
1	TEDS	TEDS
2	Exc-	Excitation -
3	Exc +	Excitation +
4	R+	¼ Bridge/Shunt
5	In+	Input +
6	Aout	analog output
7	Sns+	Sense +
8	Sns-	Sense -
9	GND	Ground
10	In-	Input -
11	+5V	+5V supply
12	+12V	+12V supply
13	IN0/A	Counter input IN0/A
14	IN1/B	Counter input IN1/B
15	IN2/Z	Counter input IN2/Z

💡 **Hint**
You can use the analog input, analog output and counters at the same time.

5.13.2.1. MULTI: Voltage

Voltage - Single ended
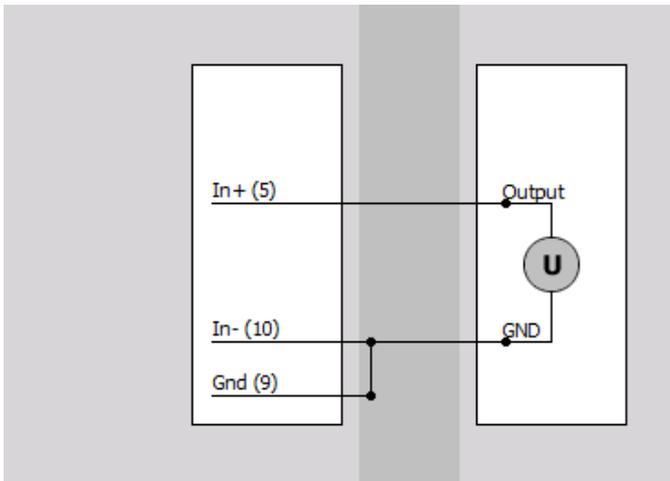
Voltage – Differential
Use only when sensor Output (+) and Output (-)
are referenced to Gnd. Gnd must be connected.
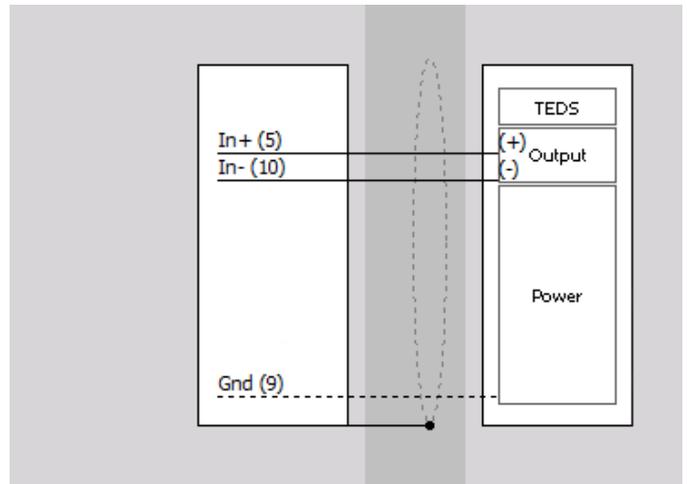

5.13.2.2. MULTI: Current

External direct shunt
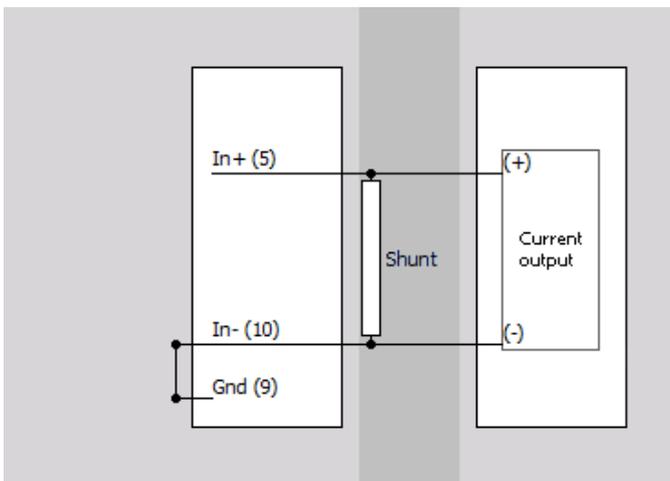
External loop powered shunt
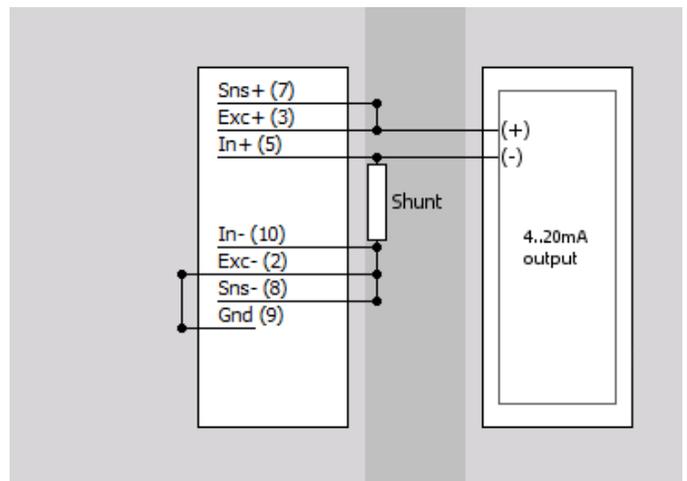
5.13.2.3. MULTI: Potentiometer
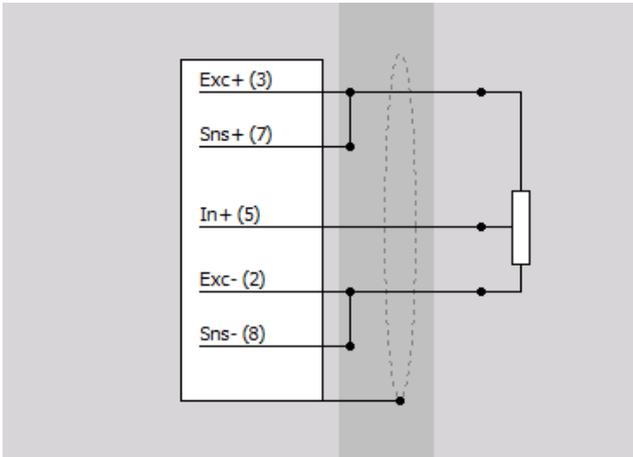
5.13.2.4. MULTI: Bridge

Full bridge
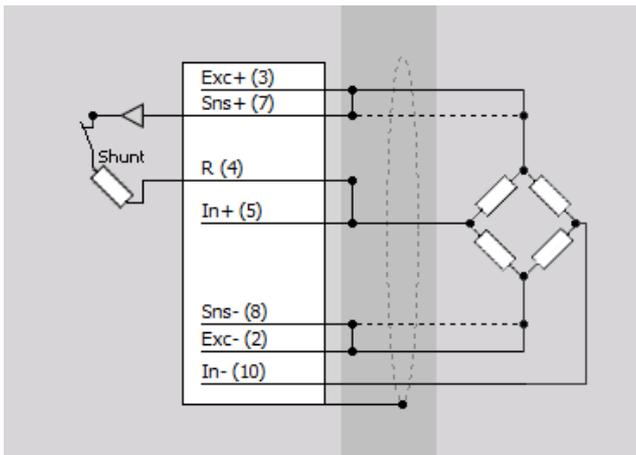
Half bridge
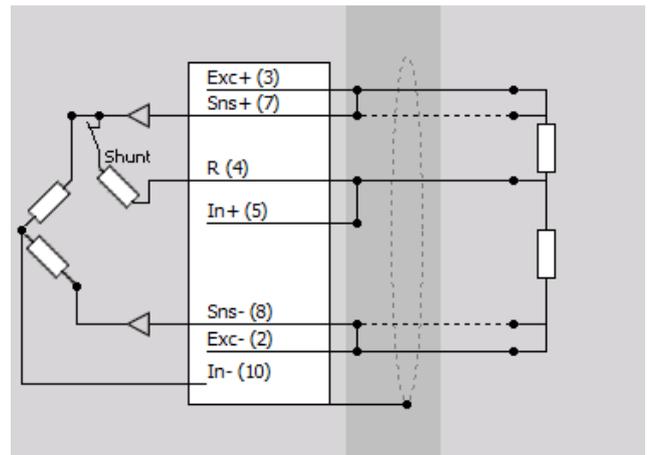
Quarter bridge – 3 wire
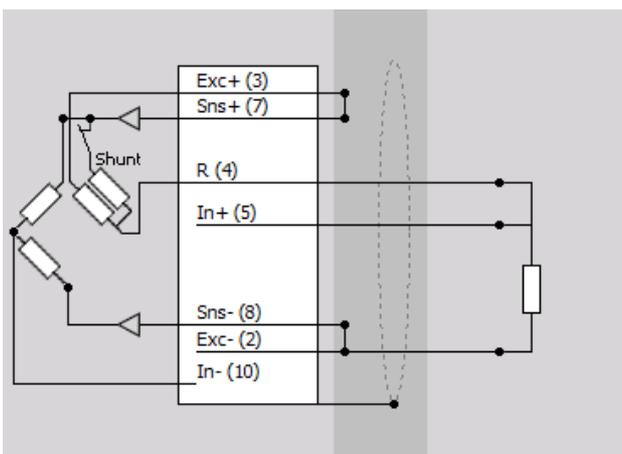
5.13.3. MULTI-L2B16f (STGM-L2B16f)

Important
For STGM-L2B16f **MULTI: Specifications** will apply, Analog Out is Not Connected!
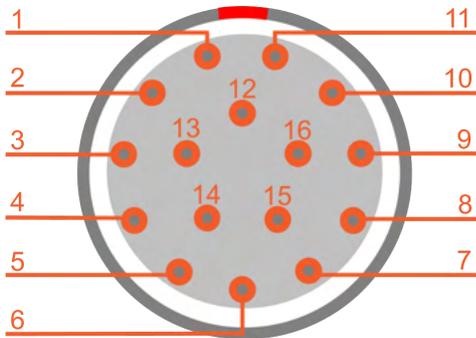
MULTI-L2B16f connector: pin-out

(16-pin LEMO female)

Pin	Name	Description
1	TEDS	TEDS
2	Exc-	Excitation -
3	Exc +	Excitation +
4	R+	¼ Bridge/Shunt
5	In+	Input +
6	Aout / NC	Analog output (w. MULTI) / Not Connected (w. STGM)
7	Sns+	Sense +
8	Sns-	Sense -
9	GND	Ground
10	In-	Input -
11	+5V	+5 V (max. 100 mA) supply
12	+14V5	+14.5 V (max. 50 mA) supply
13	IN0/A	Counter input IN0/A
14	IN1/B	Counter input IN1/B
15	IN2/Z	Counter input IN2/Z
16	-14V5	-14.5 V (max. 50 mA) supply

Hint
You can use the analog input, analog output and counters at the same time.

5.13.3.1. MULTI-L2B16f: Voltage

STGM-L2B16f: Voltage

Voltage - Single ended
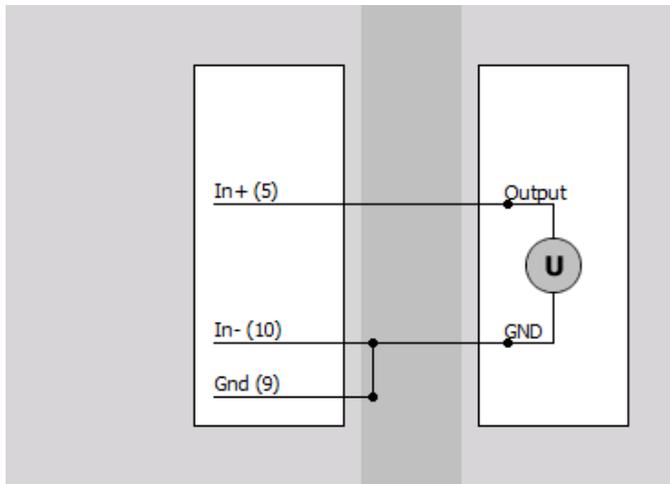
Voltage – Differential
Use only when sensor Output (+) and Output (-) are referenced to Gnd. Gnd must be connected.
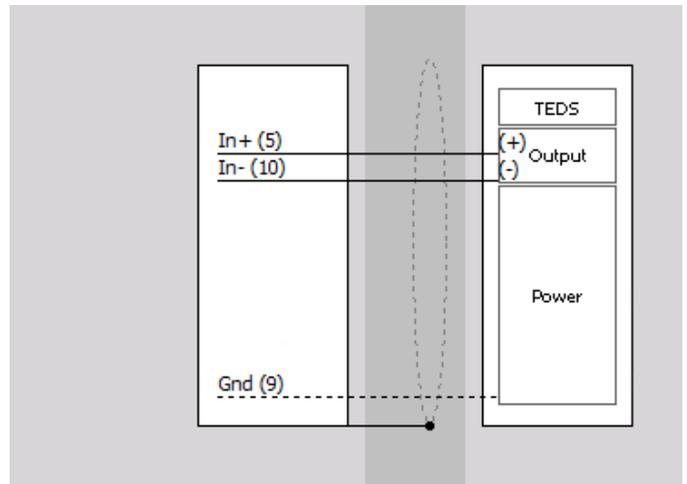
5.13.3.2. MULTI-L2B16f: Current

STGM-L2B16f: Current

External direct shunt
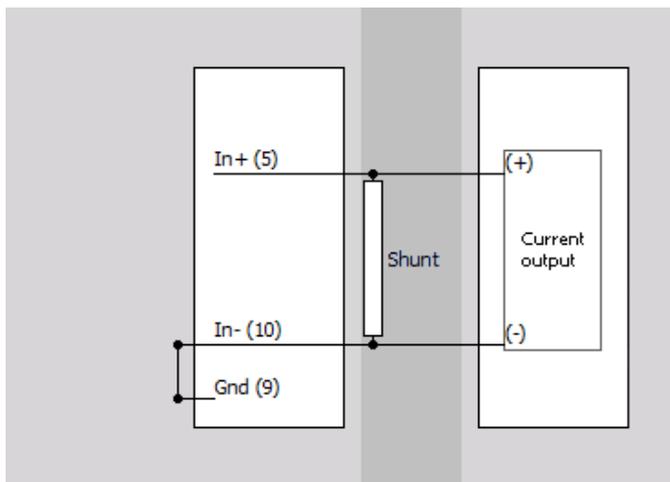
External loop powered shunt
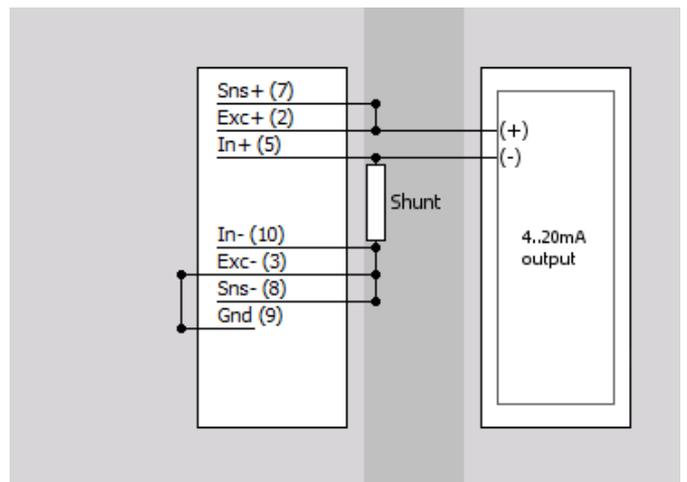
5.13.3.3. MULTI-L2B16f: Potentiometer

STGM-L2B16f: Potentiometer
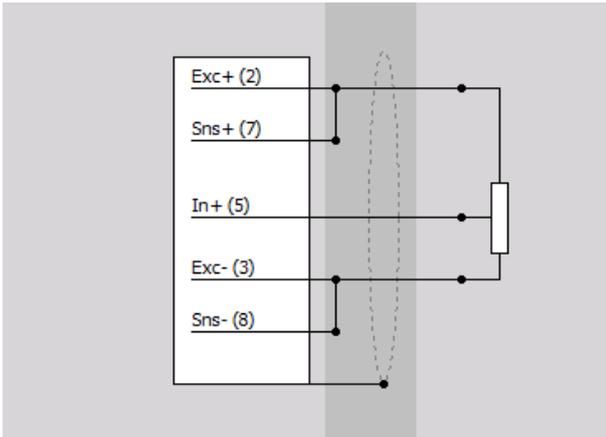
5.13.3.4. MULTI-L2B16f: Bridge

STGM-L2B16f: Bridge

Full bridge
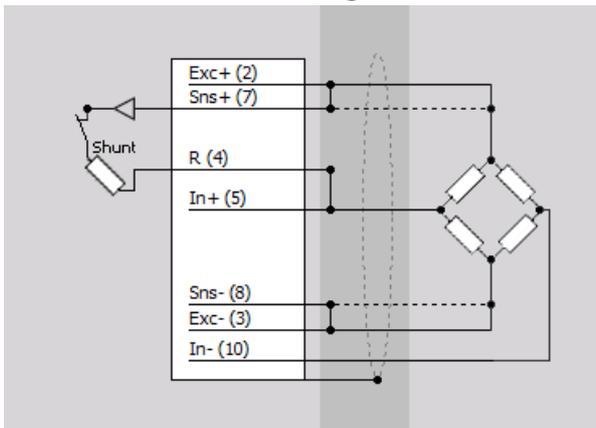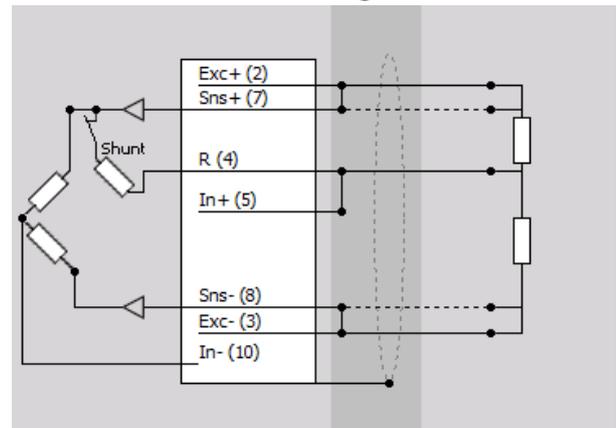
Half bridge

Quarter bridge – 3 wire
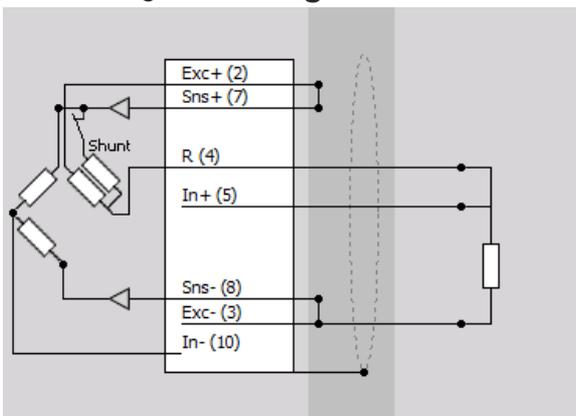
5.14. STGM / STGM+

The STGM module is a universal amplifier perfectly fitting for strain gage and voltage measurements.

Hint
Internally, potentiometer mode is actually a half-bridge connection. Pin IN- is connected to the half-bridge point.

5.14.1. STGMv3: Specifications

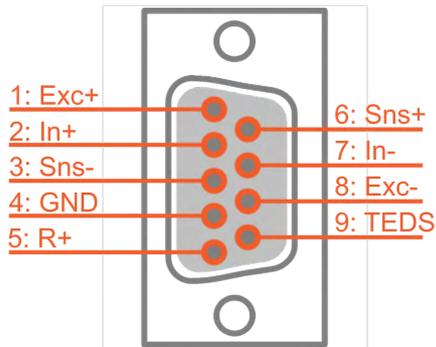| Inputs				
Input types	Voltage Full / Half / Quarter bridge strain (120 Ω and 350 Ω)			
ADC Type	24-bit delta-sigma dual core with anti-aliasing filter			
Sampling Rate	Simultaneous 200 kS/sec			
Dual Core Ranges (Low range)	**±10 V (±500 mV)**	**±1 V (50 mV)**	**±100 mV (±5 mV)**	**±10 mV (±0.5 mV)**
Gain accuracy	±0.05 % of reading			
Offset accuracy (Dual Core)	±5 (2) mV	±0.5 (0.2) mV	±0.1 (0.1) mV	±0.1 (0.1) mV
Offset accuracy after Balance Amplifier	0.2 mV	0.02 mV	0.02 mV	0.02 mV
Typ. Dynamic Range @ 10 kS (Dual Core)	-137 dB (-152 dB)	-137 dB (-147 dB)	-130 dB (-132 dB)	-112 dB (-112 dB)
Typ. Noise floor @ 10 kS (Dual Core)	-105 dB (-121 dB)	-104 dB (-111 dB)	-95 dB (-95 dB)	-75 dB (-75 dB)
Typ. CMR @ DC...50 Hz / 400 Hz / 1 kHz	88 / 86 / 84 dB	97 / 96 / 95 dB	111 / 110 / 102 dB	111 / 110 / 102 dB
Gain Drift	Typical 10 ppm/K, max. 40 ppm/K			
Offset Drift	Typical 0.3 µV/K + 5 ppm of range/K, max 2 µV/K + 10 ppm of range/K			
Gain Linearity	<0.02 %			
Inter Channel Phase-mismatch	0.02° * fin [kHz] + 0.1° (@ 200 kS/sec)			
Channel Crosstalk	-120 dB @ 10 kHz			
Input Coupling	DC			
Input Impedance	10 MΩ			
Max. Common Mode Voltage	Isolated version: ±500 V			
	Differential version: ±12 V			
Overvoltage Protection	In+ to In-: 50 V continuous; 200 V peak (10 msec)			
Excitation Voltage				
Excitation Voltage	Free programmable (16-bit DAC)			
Predefined levels	0, 1, 2.5, 5, 10 and 15 VDC			
Accuracy	±0.05 % ±2 mV			
Drift	±50 ppm/K ±100 µV/K			
Load stability	0 % to 100 % load <0.01 %			

Noise @ 10 V / 350 Ω	<150 µVrms @ 10 kS
Line regulation over 20 Ω of change	<0.005 % @ 120 Ω load
Sense Impedance	100 kΩ to Exc / >100 MΩ to GND
Current limit	45 mA
Protection	Continuous short to ground
Bridge Connection Types	
Bridge Types	Full / Half / Quarter bridge (3-wire)
Ranges	2 mV/V...1000 mV/V free programmable with Dual Core
Internal Bridge Completion	½ bridge 1 kΩ and ¼ bridge 120 Ω and 350 Ω
Typ. Bridge Completion Accuracy	0.05 %; TCR: 5 ppm/K (others on request)
Maximum sensor resistance	5 kΩ for Full and Half bridge measurements
Internal Shunt Resistor	100 kΩ, software selectable (others on request)
Typ. Shunt Resistor Accuracy	0.05 %; TCR: 10 ppm/K (others on request)
Input Short, Sensor Offset Adjust	Software selectable
Counters (only on STGM+ type)	
Inputs	1 digital counter input 3 digital inputs Fully synchronised with analog data Alarm output
Counter Modes	counting, waveform timing, encoder, tacho, gear-tooth sensor
General Counter Specifications	counting, waveform timing, encoder, tacho, gear-tooth sensor
Additional Specifications	
Input connector	DSUB-9, 8-pin LEMO-2B, 16-pin LEMO-2B (others on request)

.

5.14.2. STGM

SIRIUSi-8xSTGM

1: Exc+
2: In+
3: Sns-
4: GND
5: R+
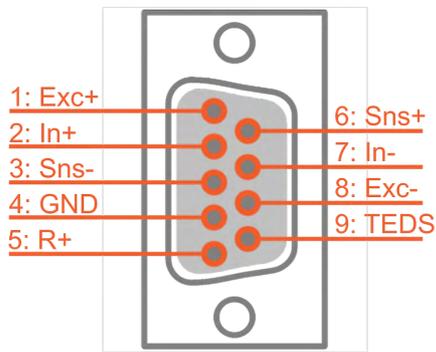
6: Sns+
7: In-
8: Exc-
9: TEDS

STGM connector: pin-out (DSUB-9 female)

Pin	Name	Description
1	Exc +	Excitation +
2	In+	Input +
3	Sns-	Sense -
4	GND	Ground
5	R+	¼ Bridge/Shunt
6	Sns+	Sense +
7	In-	Input -
8	Exc-	Excitation -
9	TEDS	TEDS

5.14.2.1. STGM: Voltage

Voltage - Single ended
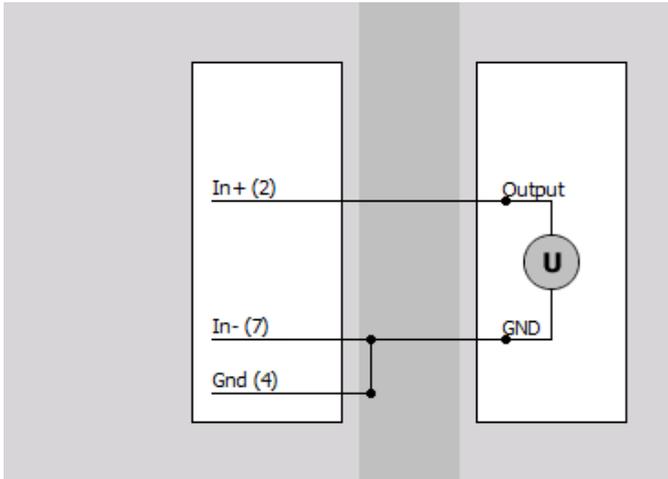
Voltage – Differential
Use only when sensor Output (+) and Output (-) are referenced to Gnd. Gnd must be connected.
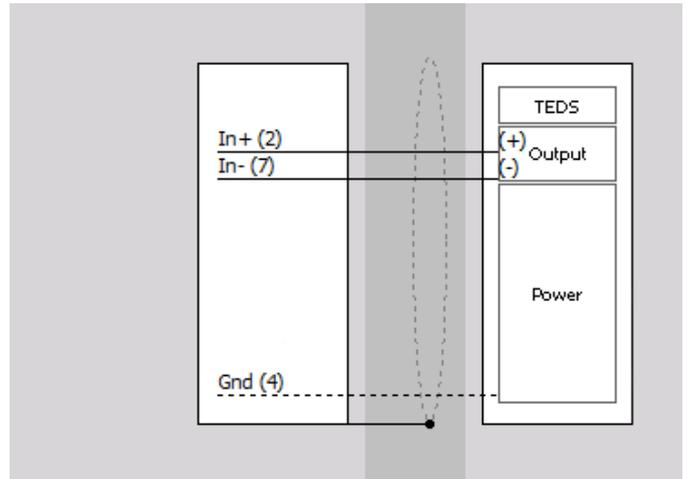
5.14.2.2. STGM: Current

External direct shunt
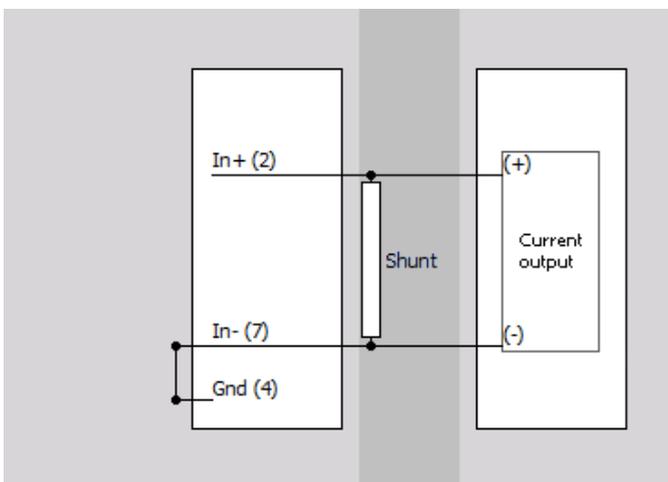
External loop powered shunt
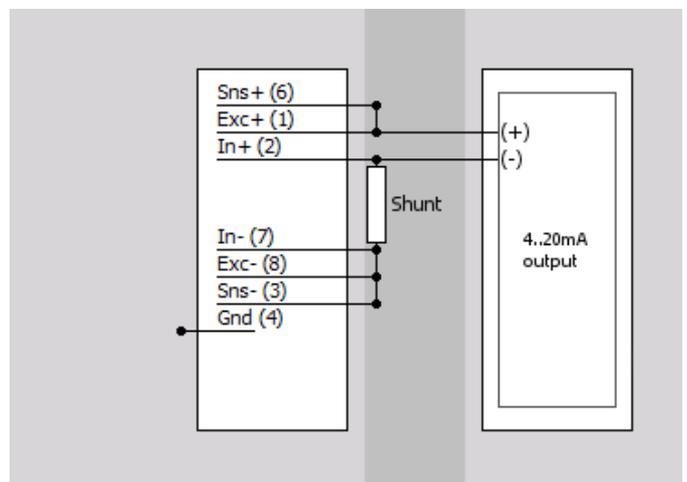
5.14.2.3. STGM: Potentiometer
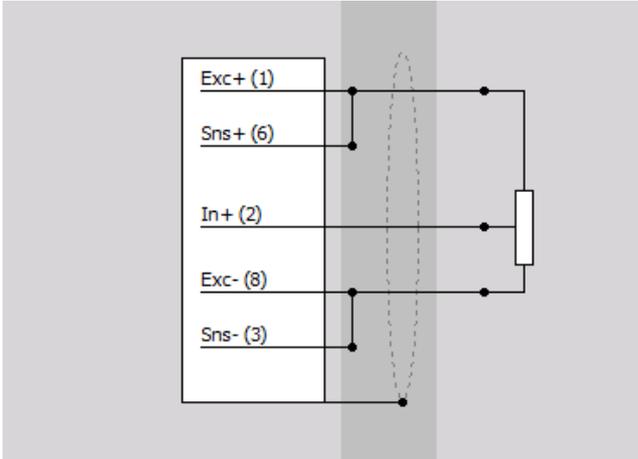
5.14.2.4. STGM: Bridge

Full bridge
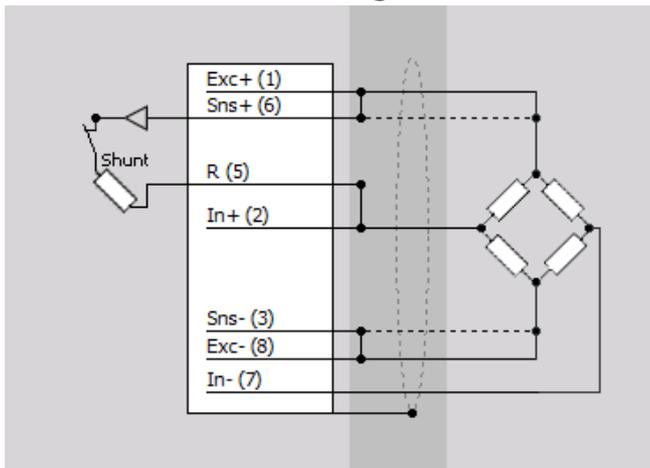
Half bridge
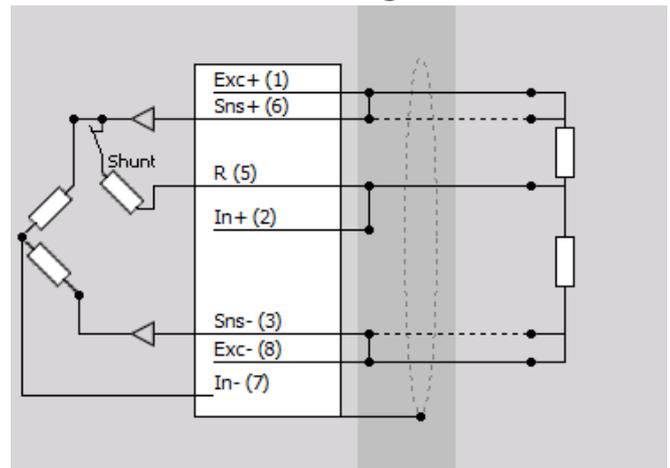
Quarter bridge – 3 wire
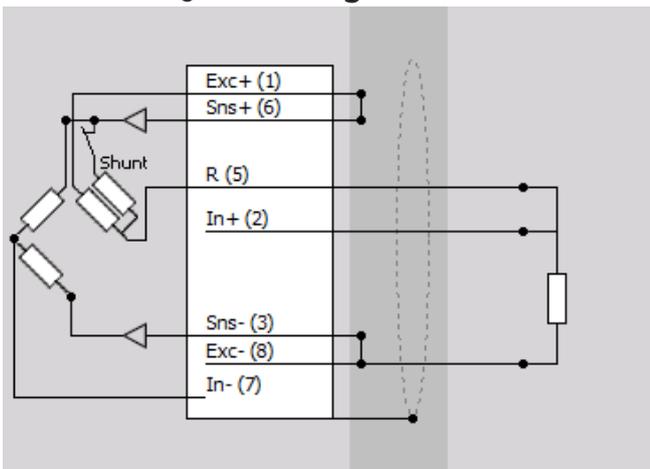
5.14.2.4.1. STGM: Bridge Accuracy

| Bridge range	Set excitation	Accuracy
2 mV/V	1 V	0.057 % of reading + 100 uV/V
20 mV/V	1 V	0.11 % of reading + 100 uV/V
200 mV/V	1 V	0.2 % of reading + 200 uV/V
1000 mV/V	1 V	0.24 % of reading + 200 uV/V
2 mV/V	2.5 V	0.055 % of reading + 40 uV/V
20 mV/V	2.5 V	0.082 % of reading + 40 uV/V
200 mV/V	2.5 V	0.12 % of reading + 80 uV/V
1000 mV/V	2.5 V	0.11 % of reading + 800 uV/V
2 mV/V	5 V	0.054 % of reading + 20 uV/V
20 mV/V	5 V	0.075 % of reading + 20 uV/V
200 mV/V	5 V	0.094 % of reading + 40 uV/V
1000 mV/V	5 V	0.088 % of reading + 400 uV/V
2 mV/V	10 V	0.055 % of reading + 10 uV/V
20 mV/V	10 V	0.066 % of reading + 20 uV/V
200 mV/V	10 V	0.066 % of reading + 200 uV/V
1000 mV/V	10 V	0.079 % of reading + 200 uV/V
2 mV/V	15 V	0.056 % of reading + 6.7 uV/V
20 mV/V	15 V	0.067 % of reading + 14 uV/V
200 mV/V	15 V	0.067 % of reading + 140 uV/V
1000 mV/V	15 V	0.077 % of reading + 140 uV/V

5.14.3. STGM-DB

The STGM-DB is the same as the STGM but has an additional DSUB-37 male connector for 8 counters or 24 digital inputs and an additional DSUB-25 female connector for 8 digital outputs. Thus the enclosure is higher than the standard enclosure.

SIRIUS-STGM-DB

20: CNT1/IN2
21: GND
22: CNT2/IN2
23: GND
24: CNT3/IN2
25: GND
26: CNT4/IN2
27: GND
28: CNT5/IN2
29: GND
30: CNT6/IN2
31: GND
32: CNT7/IN2
33: GND
34: CNT8/IN2
35: GND
36: GND
37: GND

1: CNT1/IN0
2: CNT1/IN1
3: CNT2/IN0
4: CNT2/IN1
5: CNT3/IN0
6: CNT3/IN1
7: CNT4/IN0
8: CNT4/IN1
9: CNT5/IN0
10: CNT5/IN1
11: CNT6/IN0
12: CNT6/IN1
13: CNT7/IN0
14: CNT7/IN1
15: CNT8/IN0
16: CNT8/IN1
17: +5V/500mA
18: 12V/200mA
19: Vsup/1A
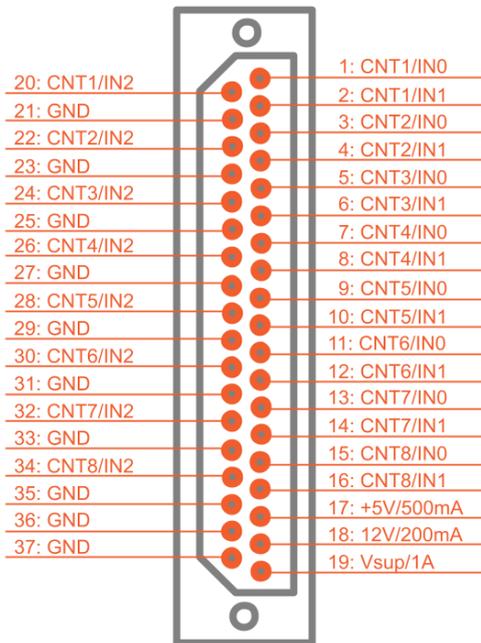
STGM-DB connector: pin-out (DSUB-37 male)

1: DO1
2: DO2
3: DO3
4: DO4
5: DO5
6: DO6
7: DO7
8: DO8
9: +5V/500mA
10: +12V/200mA
11: Vsup/1A
12: NC
13: NC

14: GND
15: GND
16: GND
17: GND
18: GND
19: GND
20: GND
21: GND
22: DO1
23: GND
24: GND
25: GND
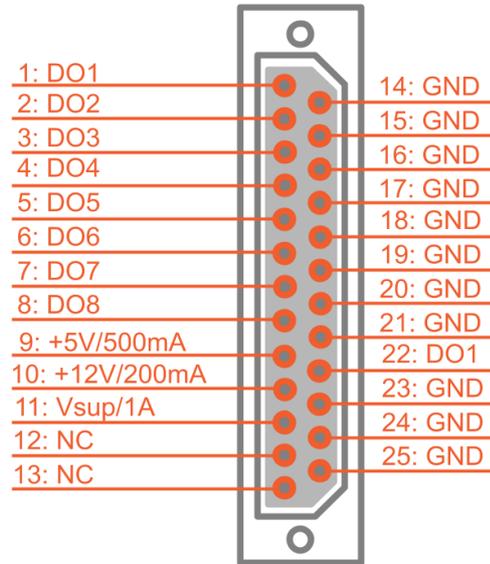
STGM-DB connector: pin-out (DSUB-25 female)

Pin	Name	Description
17	+5V/500mA	+5 Vdc out
18	+12V/200mA	+12 Vdc if Vsup > 15 V Vsup - 2 Vdc if Vsup < 15 V
19	Vsup/1A	SIRIUS input DC supply voltage

Pin	Name	Description
9	+5V/500mA	+5 Vdc out
10	+12V/200mA	+12 Vdc if Vsup > 15 V Vsup - 2 Vdc if Vsup < 15 V
11	Vsup/1A	SIRIUS input DC supply voltage

Counters parallel use	8 counter / 24 digital inputs fully synchronised with analog
Modes	counting, waveform timing, encoder, tacho, gear-tooth sensor
Digital out	High side switch to supply voltage with internal 3.9 kΩ pull down, max. 150 mA, short circuit protected.
Connector type	DSUB-37 male, DSUB-25 female

Digital output configuration
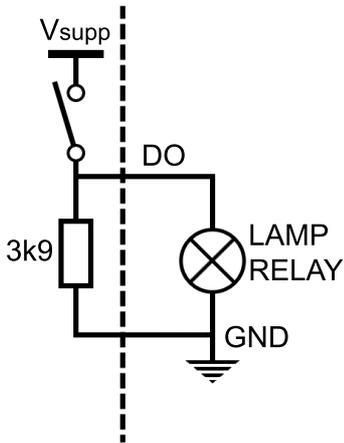
5.14.3.1. STGM-DB: Voltage
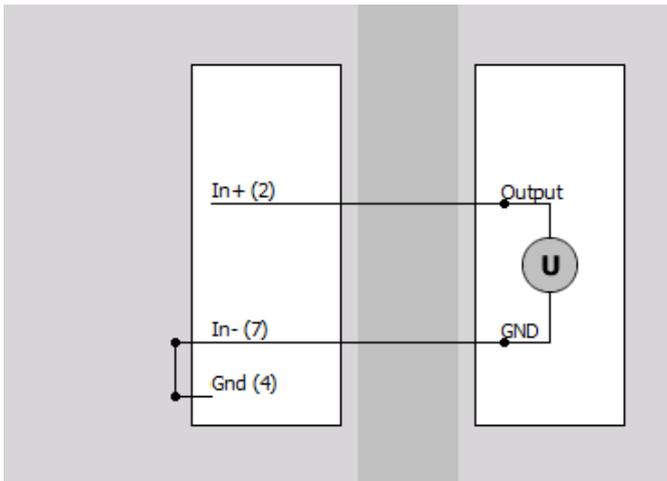
Voltage - Single ended	**Voltage – Differential**
	Use only when sensor Output (+) and Output (-) are referenced to Gnd. Gnd must be connected.
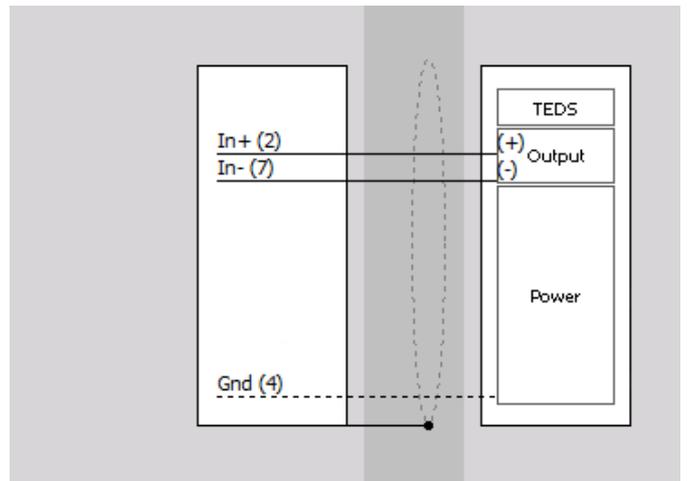
5.14.3.2. STGM-DB: Current

External direct shunt
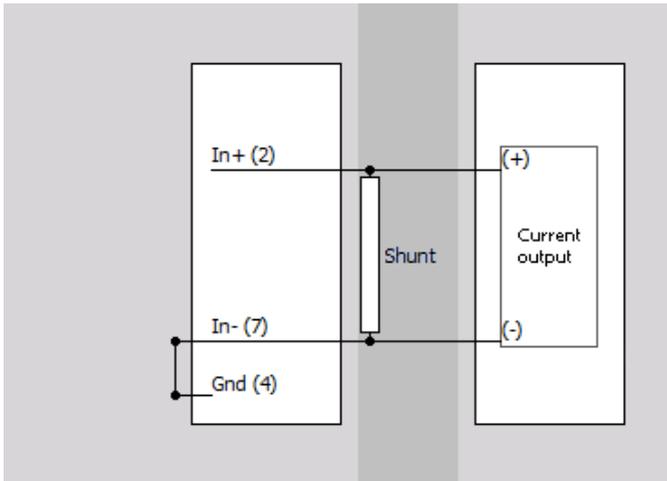

External loop powered shunt
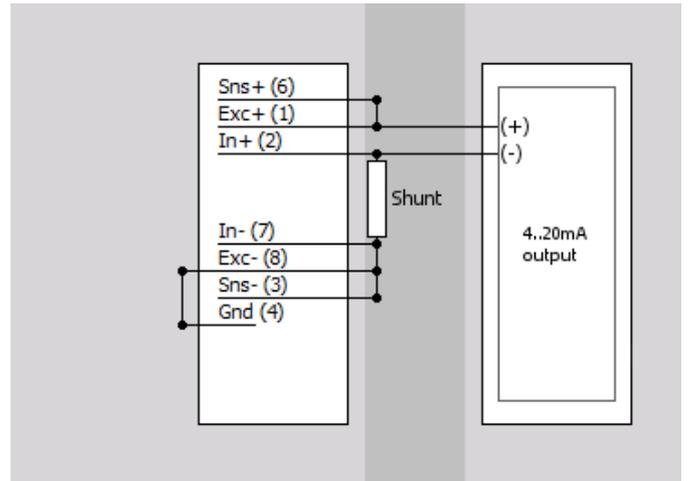
5.14.3.3. STGM-DB: Potentiometer

Potentiometer
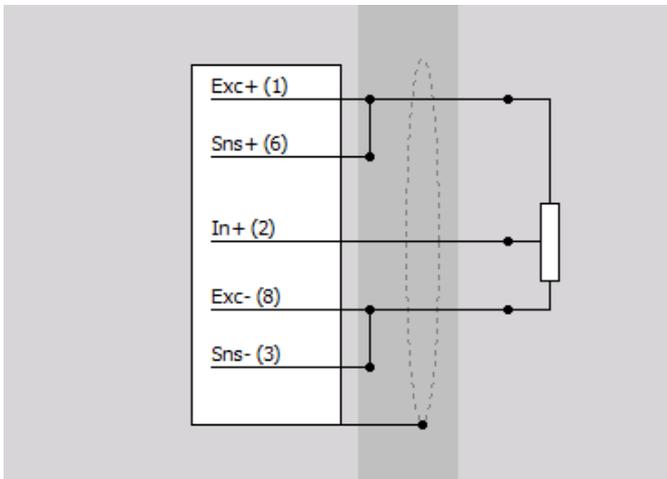
5.14.3.4. STGM-DB: Bridge

Full bridge
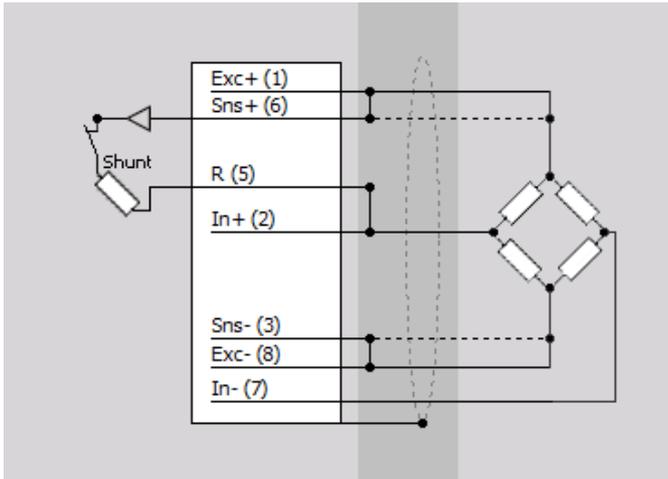
Half bridge
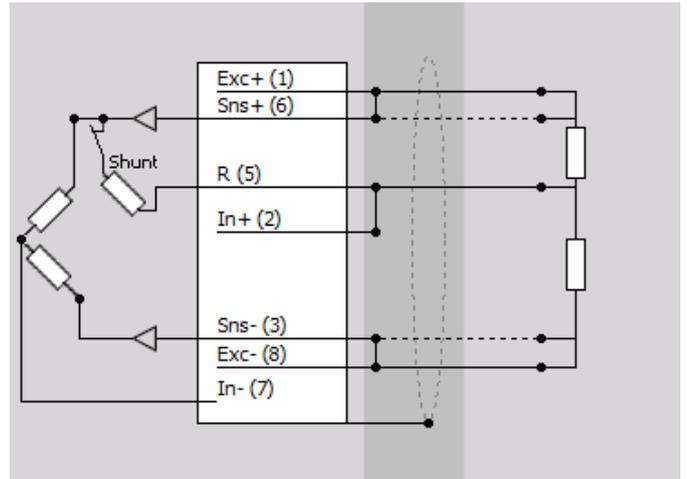
Quarter bridge – 3 wire
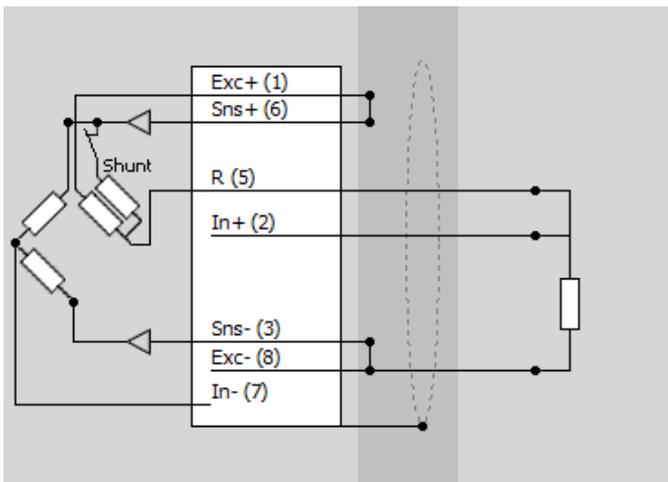
5.14.4. STGM-L2B8f

The STGM-L2B8f is a custom made STGM module with LEMO connectors.
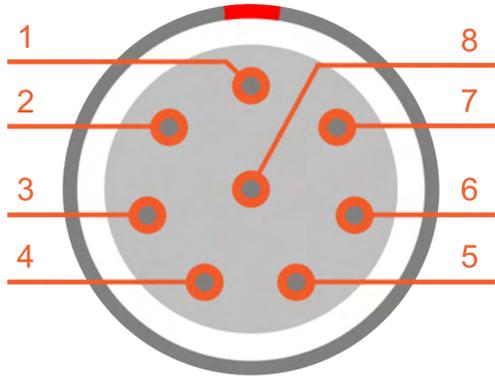
STGM-L2B8f connector: pin-out (LEMO female)

Pin	Name	Description
1	Exc +	Excitation +
2	In-	Input -
3	In+	Input +
4	Exc-	Excitation -
5	Shield	connection to chassis
6	TEDS	TEDS
7	GND	Ground
8	+12 V	+12 V

5.14.4.1. STGM-L2B8f: Voltage

Voltage - Single ended
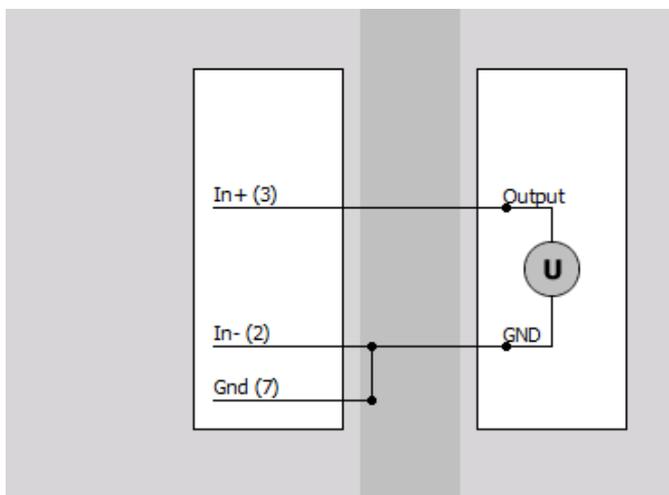
Voltage – Differential
Use only when sensor Output (+) and Output (-) are referenced to Gnd. Gnd must be connected.
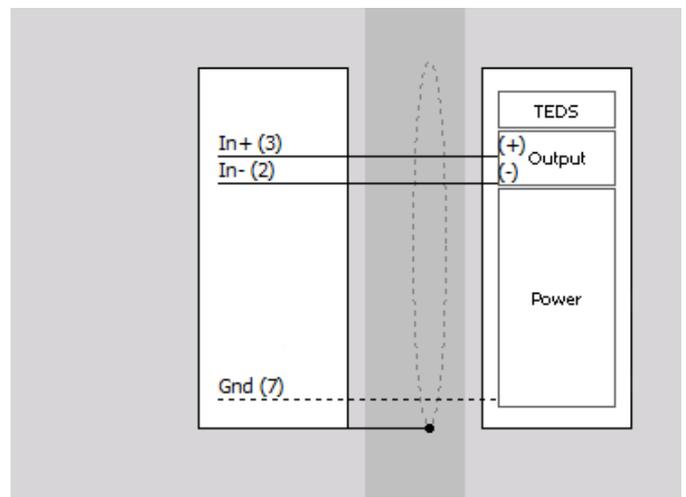
5.14.4.2. STGM-L2B8f: Current

External direct shunt
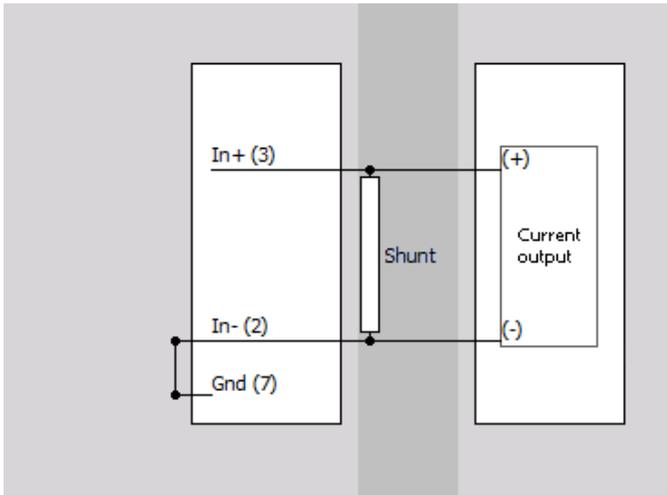
External loop powered shunt
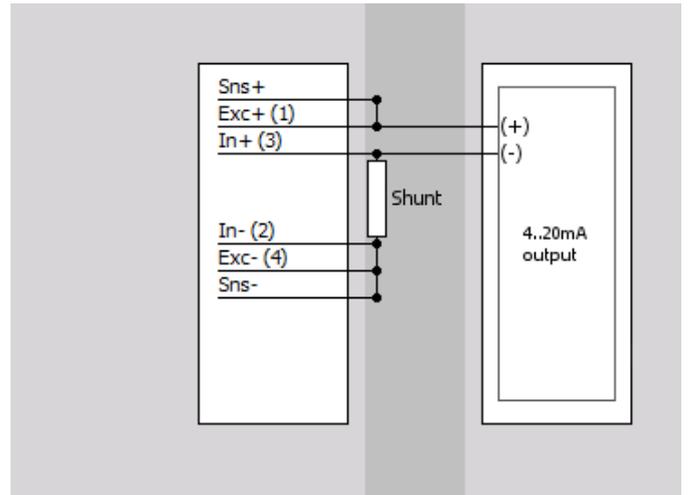
5.14.4.3. STGM-L2B8f: Potentiometer

Potentiometer
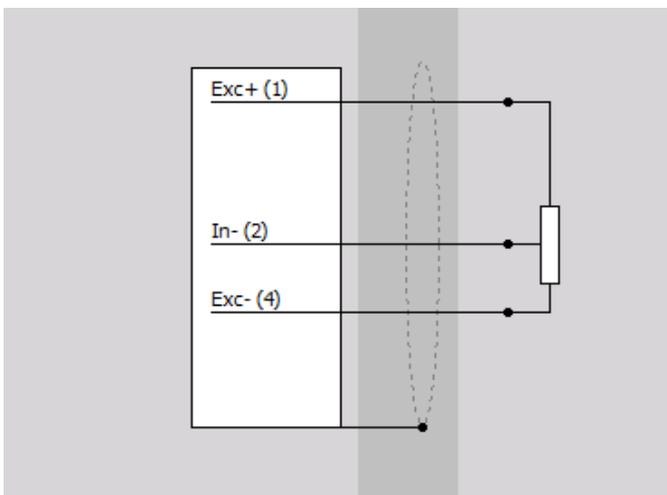
5.14.4.4. STGM-L2B8f: Bridge

Full bridge
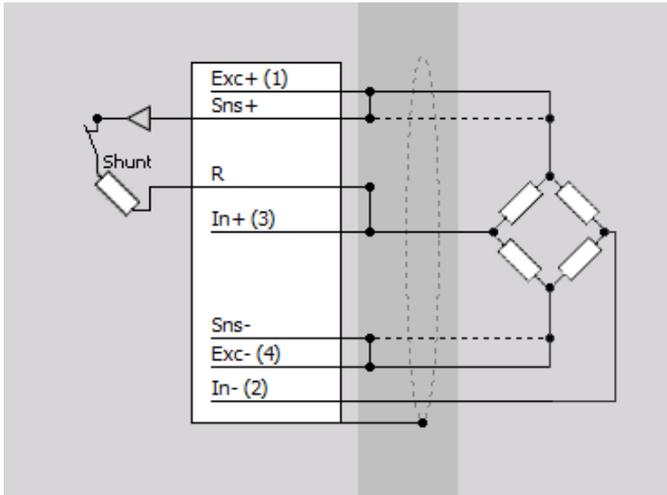
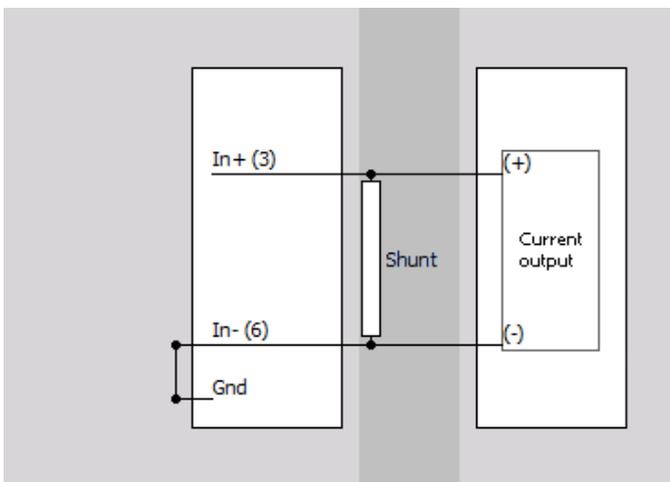
Half bridge
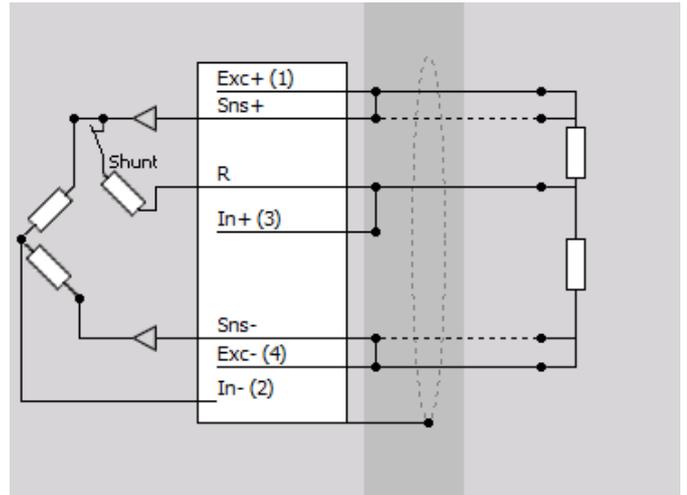
Quarter bridge – 3 wire
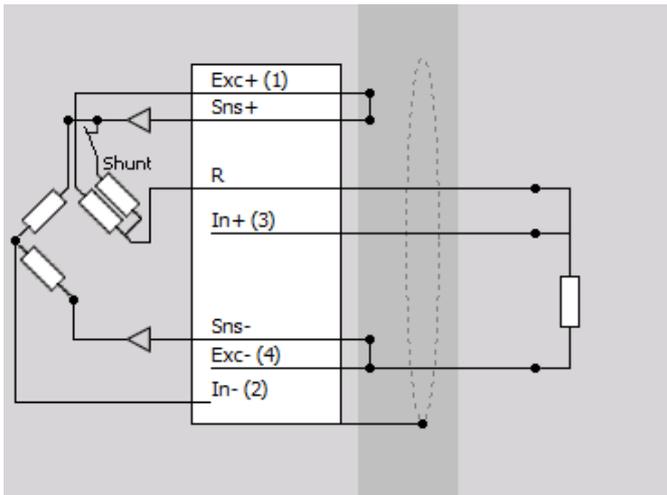
5.14.5. STGM+ (Counter)

The STGM+ is the same as the STGM but has an additional 7-pin Lemo connector for the counter.
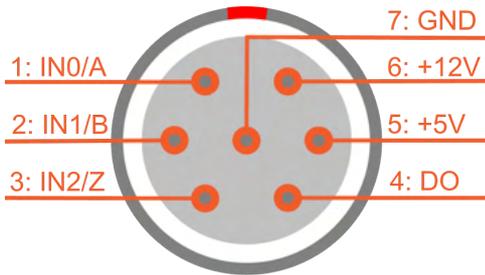
7: GND
1: IN0/A
6: +12V
2: IN1/B
5: +5V
3: IN2/Z
4: DO

CNT connector: pin-out (7-pin LEMO female)

SIRIUSi-8xSTGM+

Connector type: L1B7f
Connector on the module: EGG.1B.307.CLL
Mating cable connector: FGG.1B.307.CLAD52

⚠ Caution

GND of the counter input is connected to the GND of the analog channel.

Digital output configuration
The "switch" of the open collector output is closed when active.

< 30 V
R
DO   DO
GND

< 30 V
DO
LAMP
RELAY
GND
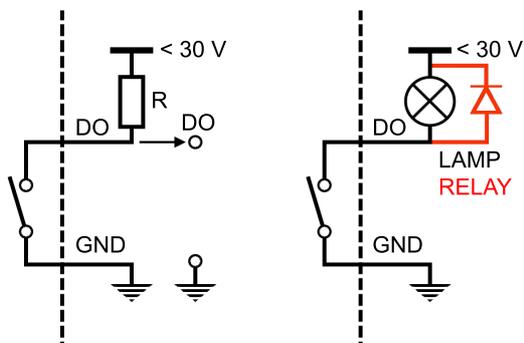
5.15. STG / STG+

The STG module is THE universal amplifier perfectly fitting for strain gauge and mid-level voltage measurements with powerful sensor constant voltage and current excitation. It is also our most frequently sold amplifier from the SIRIUS product line.

Hint
Internally, potentiometer mode is actually a half-bridge connection. Pin IN- is connected to the half-bridge point.

5.15.1. STG: Specifications

Inputs				
Input types	Voltage Full/Half/Quarter bridge strain (120 Ω and 350 Ω) Potentiometer, RTD, Resistance Current (ext. Shunt)			
ADC Type	24-bit delta-sigma dual core with anti-aliasing filter			
Sampling Rate	Simultaneous 200 kS/sec			
Dual Core Ranges (Low)	**±50 V (±2.5 V)**	**±10 V (±500 mV)**	**±1 V (±50 mV)**	**±100 mV (±5 mV)**
Gain accuracy	±0.05 % of reading			
Offset accuracy (Dual Core)	±20 (10) mV	±2 (1) mV	±0.2 (0.2) mV	±0.1 (0.1) mV
Offset Accuracy after Balance Amplifier	±1 mV	±0.1 mV	±0.02 mV	±0.01 mV
Typ. Dynamic Range @ 10 kS (Dual Core)	-137 dB (-147 dB)	-137 dB (-152 dB)	-137 dB (-147 dB)	-135 dB (-137 dB)
Typ. Noise floor @ 10 kS (Dual Core)	-108 dB (-118 dB)	-107 dB (-125 dB)	-107 dB (-113 dB)	-100 dB (-100 dB)
Typ. CMR @ DC...50 Hz / 400 Hz / 1 kHz	56 / 56 / 56 dB	88 / 86 / 84 dB	97 / 96 / 95 dB	115 / 112 / 102 dB
Gain Drift	Typical 10 PPM/K, max. 40 PPM/K			
Offset Drift	Typical 0.3 µV/K + 2 ppm of range/K, max 0.8 µV/K + 10 ppm of range/K			
Gain Linearity	<0.02 %			
Inter Channel Phase-mismatch	0.02° * fin [kHz] + 0.1° (@ 200 kS/sec)			
Channel Crosstalk	-120 dB @ 10 kHz			
Input Coupling	DC, AC 1 Hz (3 Hz, 10 Hz per SW)			
Input Impedance	1 MΩ between IN+ and IN- for 50 V Range; all other Ranges > 1 GΩ			
Max. Common Mode Voltage	Isolated version: ±500 V Differential version: 50 V Range: ±60 V; all other Ranges: ±12 V			
Overvoltage Protection	50 V Range: 300 V; all other Ranges: 50 V (200 V peak for 10 msec)			
Excitation Voltage				
Excitation Voltage	Free programmable (16-bit DAC)			
Predefined levels	0, 1, 2.5, 5, 10, 15 and 20 VDC			
Accuracy	±0.05 % ±2 mV			

Drift	±10 ppm/K ±100 µV/K			
Load stability	0 % to 100 % load <0.01 %			
Noise @ 10 V / 350 Ω	<150 µVrms @ 10 kS			
Line regulation over 20 Ω of change	<0.005 % @ 120 Ω load			
Sense Impedance to Exc / to GND	100 kΩ / >100 MΩ			
Current limit	100 mA (max. 800 mW)			
Protection	Continuous short to ground			
Excitation Current	**STGv2**		**STGv3**	
Excitation Current	Free programmable (16-bit DAC)			
Predefined levels	0.1, 1, 2, 5, 10, 20 and 60 mA DC			
Ranges	0.1 - 10 mA	10 - 60 mA	0.01 - 1 mA	1 - 60 mA
Accuracy	0.1 % ±2 µA	0.5 % ±50 µA	preview 0.02 % ±2 µA	preview 0.25 % ±20 µA
Drift	15 ppm/K	100 ppm/K	preview 15 ppm/K	preview 100 ppm/K
Compliance voltage	20 Volt, max. 500 mW			
Output Impedance	>1 MΩ			
Bridge Connection Types				
Bridge types	Full / Half / Quarter bridge (3-wire or 4-wire)			
Ranges	2 mV/V...1000 mV/V free programmable with Dual Core			
Internal Bridge Completion	Half and Quarter bridge 120 Ω and 350 Ω			
Maximum sensor resistance	5 kΩ for Full and Half bridge measurements			
Typ. Bridge Completion Accuracy	0.05 %; TCR: 2 ppm/K (others on request)			
Internal Shunt Resistor	59.88 kΩ, 175 kΩ, software selectable (others on request)			
Typ. Shunt Resistor Accuracy	0.05 %; TCR: 10 ppm/K (others on request)			
Input Short, Sensor Offset Adjust	Software selectable			
Counters (only on STG+ type)				
Inputs	1 digital counter input 3 digital inputs Fully synchronised with analog data Alarm output			
Counter Modes	counting, waveform timing, encoder, tacho, gear-tooth sensor			
General Counter Specifications	See "SIRIUS counter specifications"			
Additional Specifications				
Input connector	DSUB-9, 8-pin LEMO-2B, 16-pin LEMO-2B (others on request)			
TEDS support	Standard + DSI® adapters			

5.15.2. STG

SIRIUSi-8xSTG

1: Exc+
2: In+
3: Sns-
4: GND
5: R+

6: Sns+
7: In-
8: Exc-
9: TEDS

STG connector: pin-out (DSUB-9 female)

| Pin	Name	Description
1	Exc +	Excitation +
2	In+	Input +
3	Sns-	Sense -
4	GND	Ground
5	R+	¼ Bridge/Shunt
6	Sns+	Sense +
7	In-	Input -
8	Exc-	Excitation -
9	TEDS	TEDS

## 5.15.2.1. STG: Voltage

Voltage - Single ended
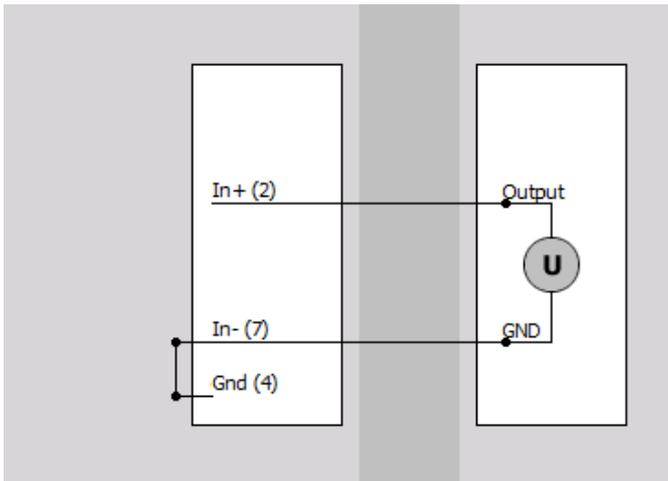
Voltage – Differential
Use only when sensor Output (+) and Output (-) are referenced to Gnd. Gnd must be connected.
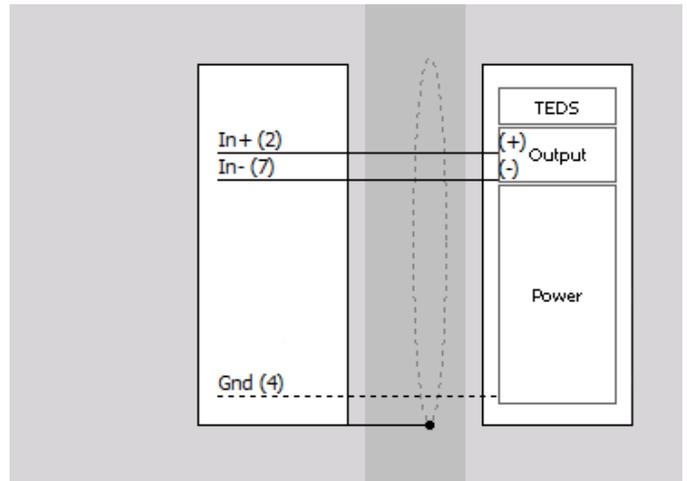

5.15.2.2. STG: Current

External direct shunt
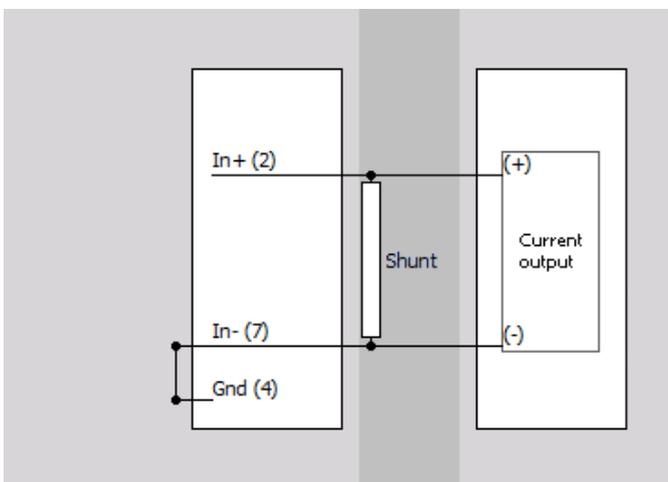
External loop powered shunt
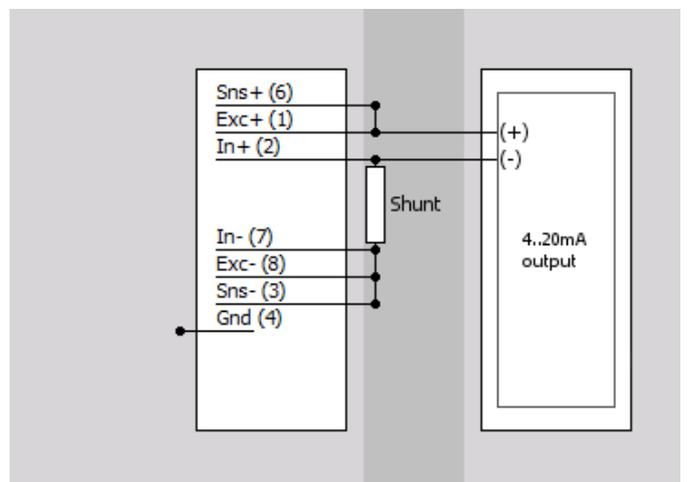
5.15.2.3. STG: Temperature
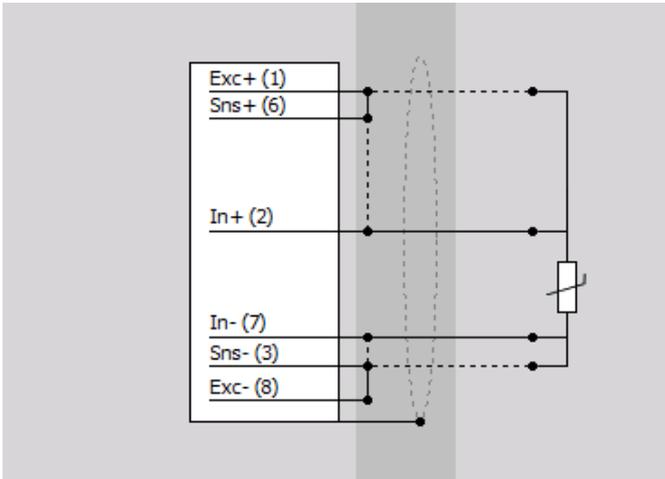
🔧 **Example**

These are two examples on how you can connect a 3-wire RTD temperature sensor. The sensor should be connected as it is recommended by the manufacturer.
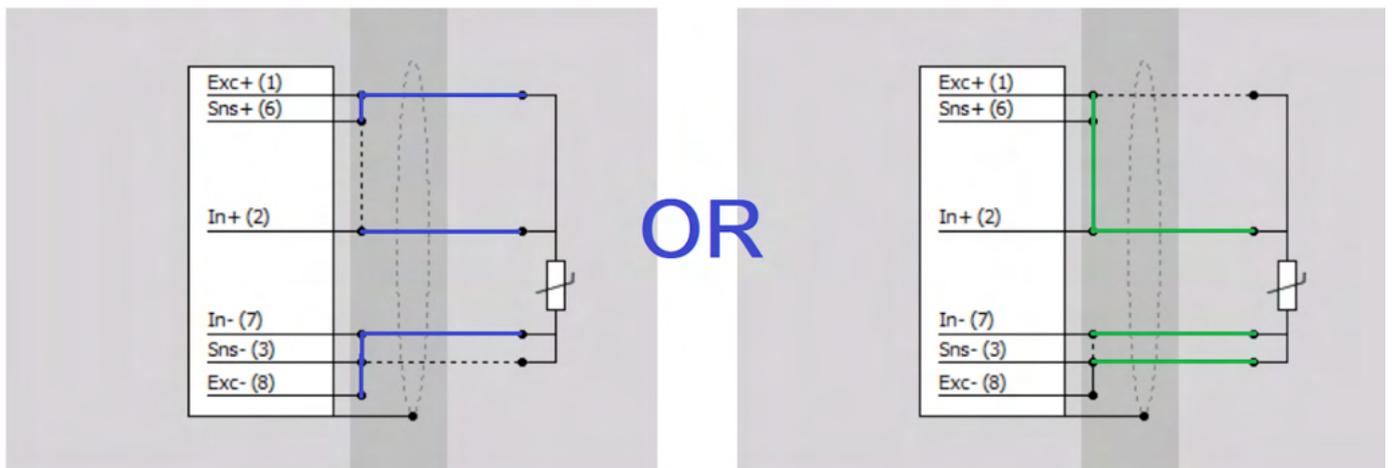
5.15.2.4. STG: Resistance
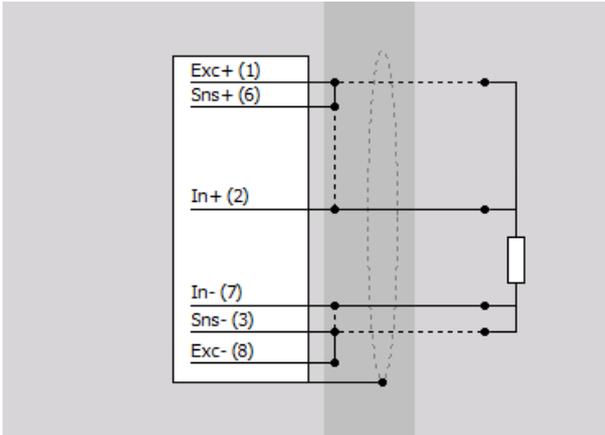
🔧 **Example**

These are two examples on how you can make a 3-wire connection for resistance measurements.

OR
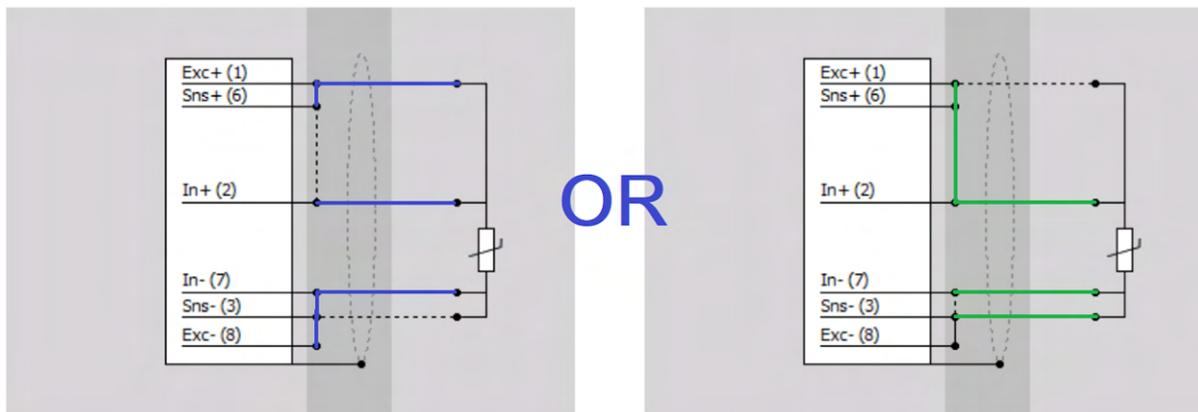
## 5.15.2.5. STG: Potentiometer
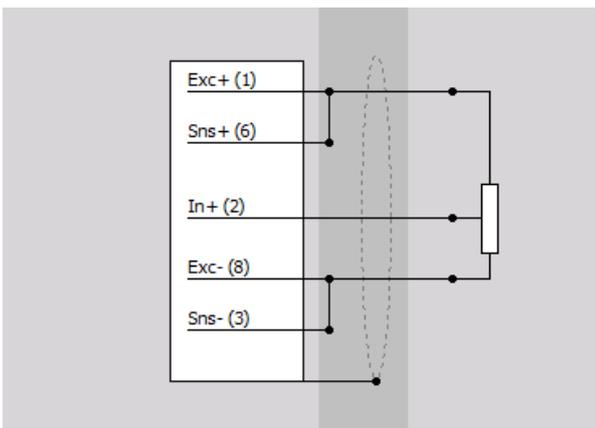
5.15.2.6. STG: Bridge

Full bridge
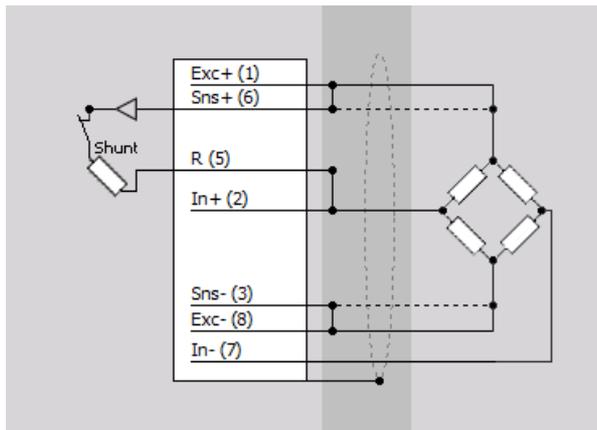
Half bridge
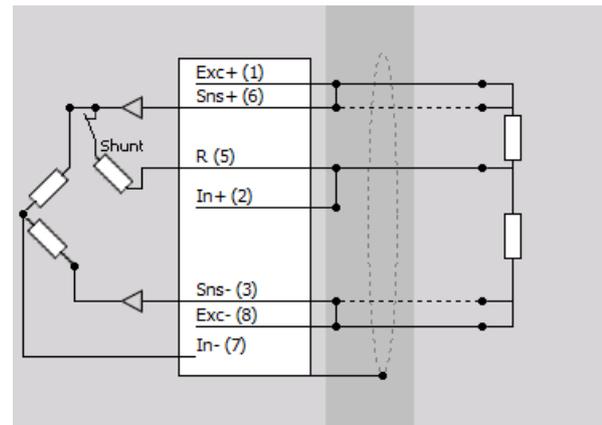
Quarter bridge – 3 wire
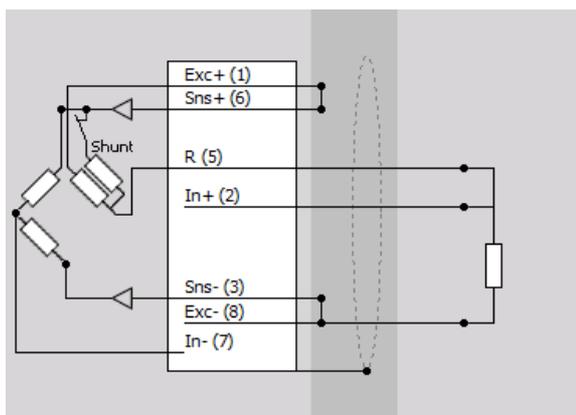
Quarter Bridge – 4 wire
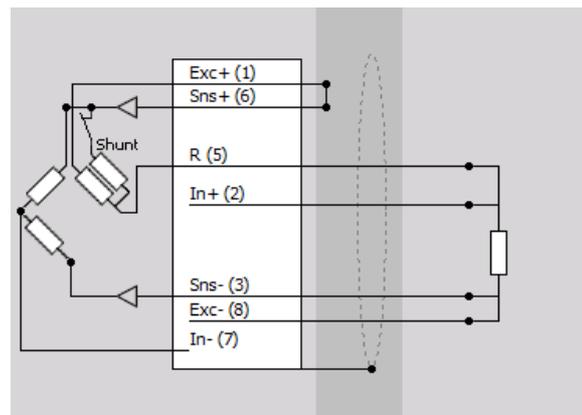
5.15.2.6.1. STG: Bridge Accuracy

Bridge range	Set excitation	Accuracy
2 mV/V	1 V	0.057 % of reading + 100 uV/V
20 mV/V	1 V	0.11 % of reading + 100 uV/V
200 mV/V	1 V	0.2 % of reading + 200 uV/V
1000 mV/V	1 V	0.24 % of reading + 200 uV/V
2 mV/V	2.5 V	0.055 % of reading + 40 uV/V
20 mV/V	2.5 V	0.082 % of reading + 40 uV/V
200 mV/V	2.5 V	0.12 % of reading + 80 uV/V
1000 mV/V	2.5 V	0.12 % of reading + 400 uV/V
2 mV/V	5 V	0.054 % of reading + 20 uV/V
20 mV/V	5 V	0.075 % of reading + 20 uV/V
200 mV/V	5 V	0.094 % of reading + 40 uV/V
1000 mV/V	5 V	0.094 % of reading + 200 uV/V
2 mV/V	10 V	0.055 % of reading + 10 uV/V
20 mV/V	10 V	0.066 % of reading + 20 uV/V
200 mV/V	10 V	0.073 % of reading + 100 uV/V
1000 mV/V	10 V	0.083 % of reading + 100 uV/V
2 mV/V	15 V	0.056 % of reading + 6.7 uV/V
20 mV/V	15 V	0.067 % of reading + 14 uV/V
200 mV/V	15 V	0.072 % of reading + 67 uV/V
1000 mV/V	15 V	0.079 % of reading + 67 uV/V
2 mV/V	20 V	0.056 % of reading + 5.0 uV/V
20 mV/V	20 V	0.067 % of reading + 10 uV/V
200 mV/V	20 V	0.071 % of reading + 50 uV/V
1000 mV/V	20 V	0.077 % of reading + 50 uV/V

5.15.3. STG-L2B7f

SIRIUSi-8xSTG-L2B7f

1: Exc+
2: Sns+
3: IN+
7: R+
6: IN-
5: Sns-
4: Exc-
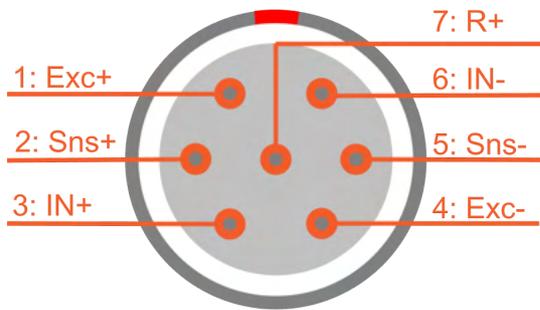
STG-L2B7f connector: pin-out (7-pin LEMO female)

Pin	Name	Description
1	Exc +	Excitation +
2	Sns+	Sense +
3	In+	Input +
4	Exc -	Excitation -
5	Sns-	Sense -
6	In-	Input -
7	R+	¼ Bridge/Shunt

Mating Connector: FGG.2B.307.CLADxx

5.15.3.1. STG-L2B7f: Voltage

Voltage - Single ended
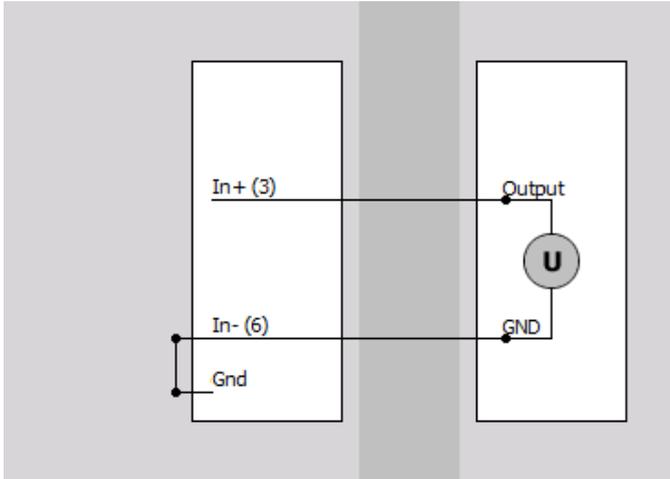
Voltage – Differential
Use only when sensor Output (+) and Output (-) are referenced to Gnd. Gnd must be connected.
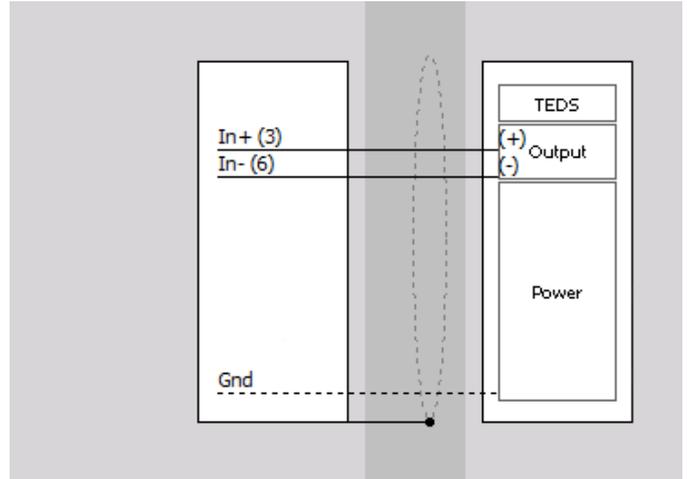
5.15.3.2. STG-L2B7f: Current

External direct shunt

External loop powered shunt
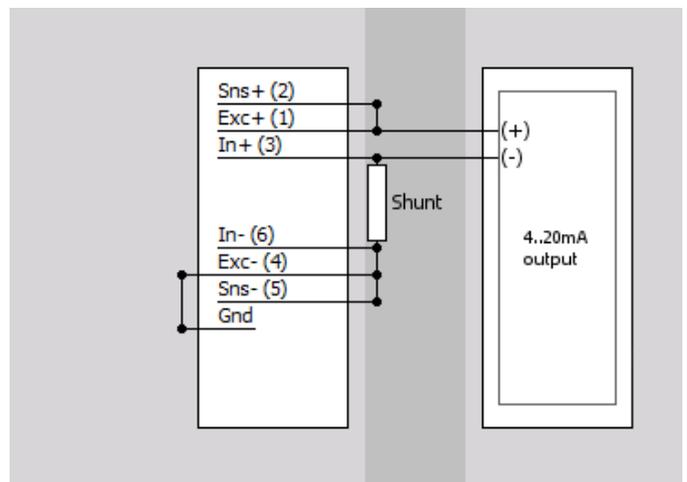
5.15.3.3. STG-L2B7f: Temperature
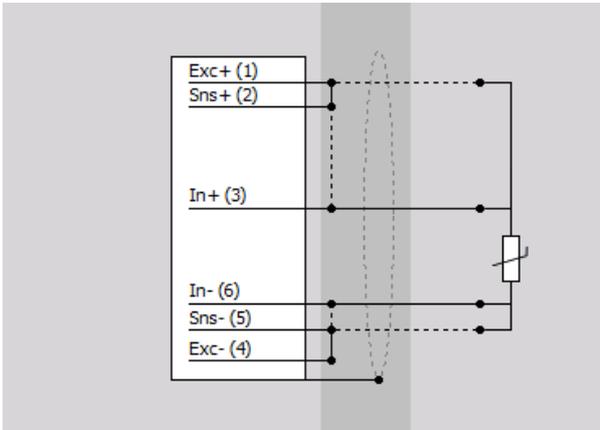
5.15.3.4. STG-L2B7f: Resistance
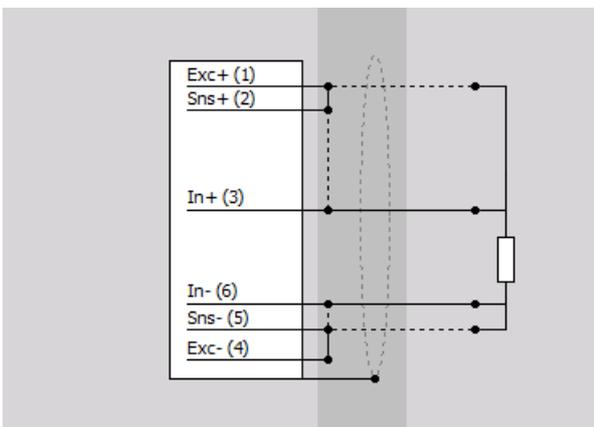
5.15.3.5. STG-L2B7f: Potentiometer

Internally, this is a half bridge connection.
IN- is connected to the HB point.
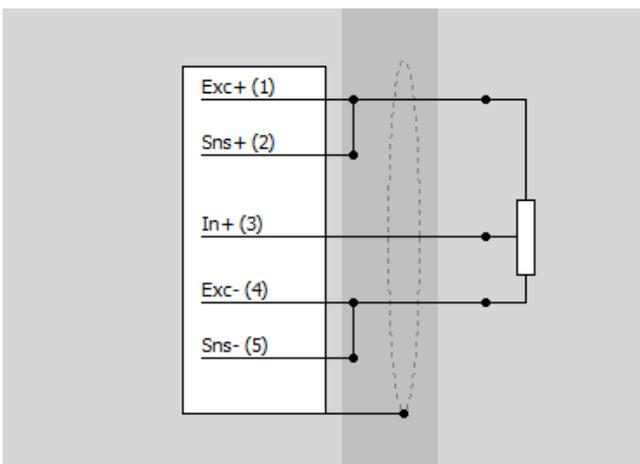
5.15.3.6. STG-L2B7f: Bridge

Full bridge
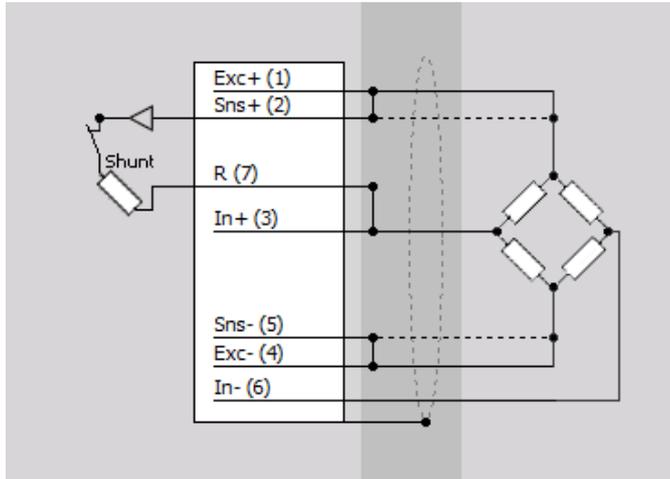
Half bridge
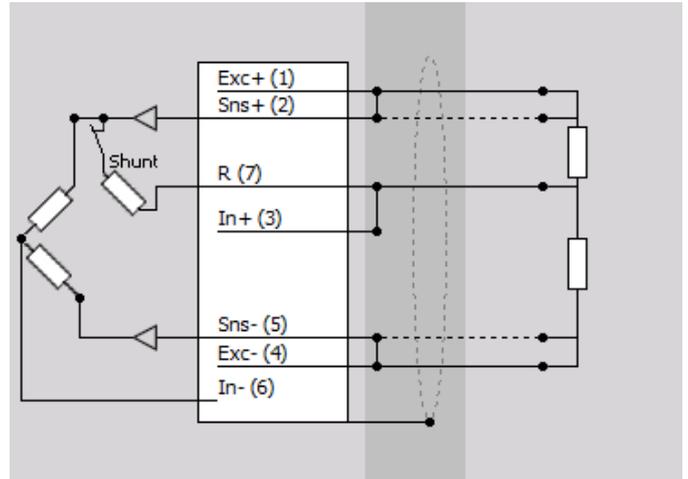
Quarter bridge – 3 wire
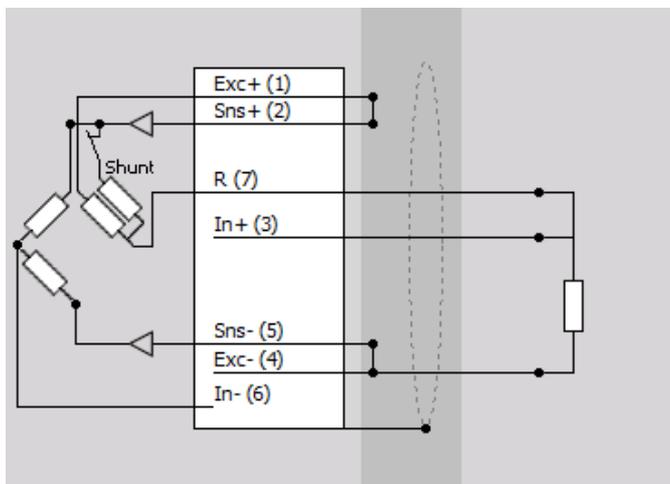
Quarter Bridge – 4 wire

5.15.4. STG-L2B10f

SIRIUSi-8xSTG-L2B10f
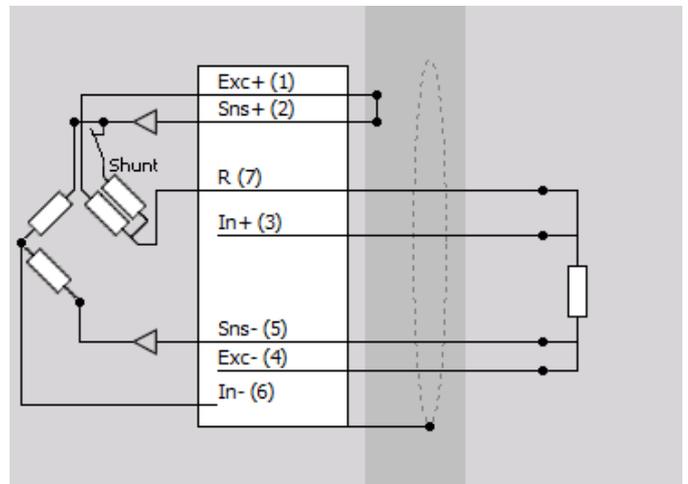
1: Exc+
2: Exc-
3: In+
4: In-
9: R+
8: TEDS
7: DI-CNT
6: Sns-
5: Sns+
10: GND
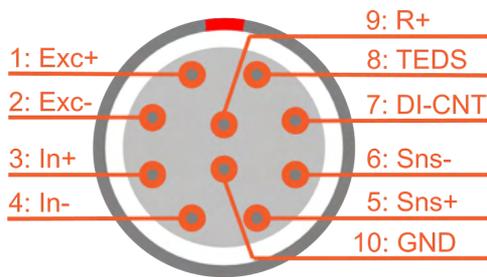
STG-L2B10f connector: pin-out (10-pin LEMO female)

Mating Connector: FGG.2B.310.CLADxx

Pin	Name	Description
1	Exc +	Excitation +
2	Exc -	Excitation -
3	In+	Input +
4	In-	Input -
5	Sns+	Sense +
6	Sns-	Sense -
7	Di-Cnt	Digital I/O, Counter
8	TEDS	TEDS
9	R+/SHUNT	Resistance / SHUNT
10	GND	Ground-iso

5.15.4.1. STG-L2B10f: Voltage

Voltage - Single ended
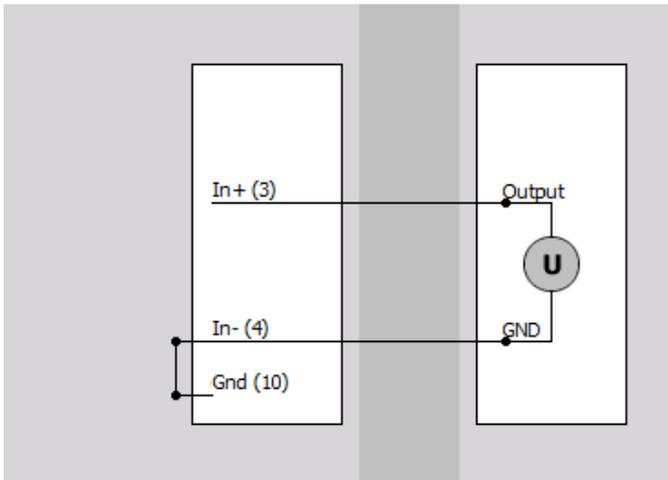
Voltage – Differential
Use only when sensor Output (+) and Output (-) are referenced to Gnd. Gnd must be connected.
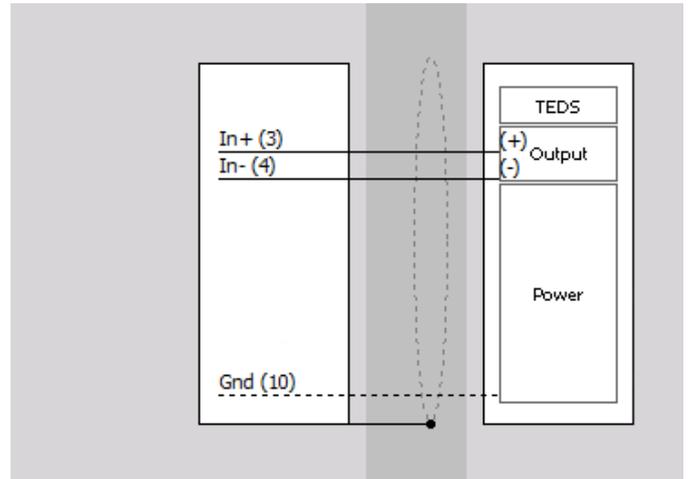
5.15.4.2. STG-L2B10f: Current

External direct shunt
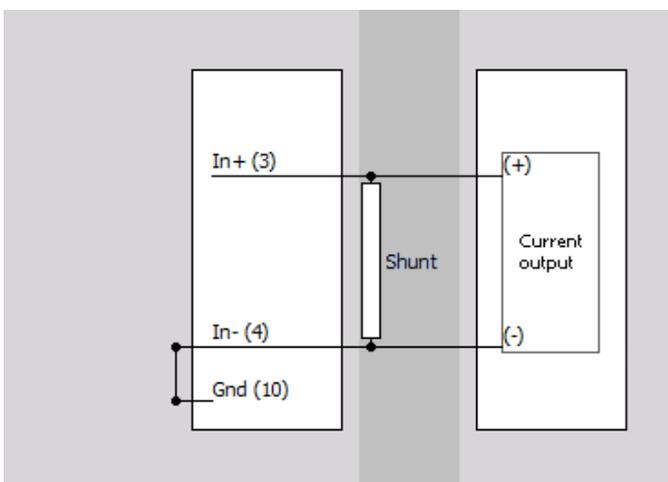
External loop powered shunt
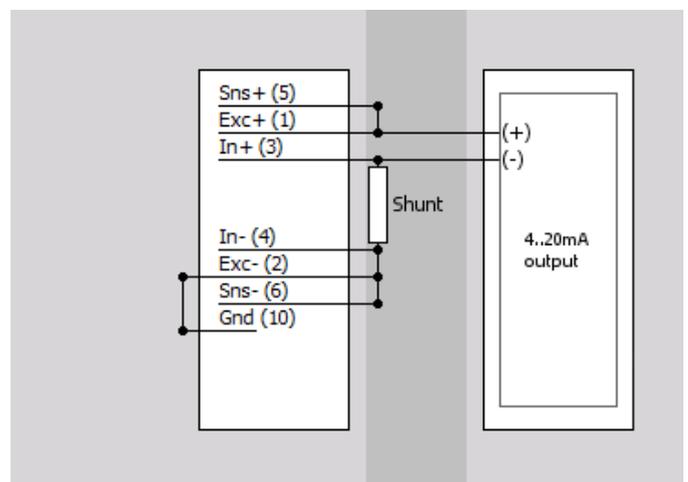
5.15.4.3. STG-L2B10f: Temperature
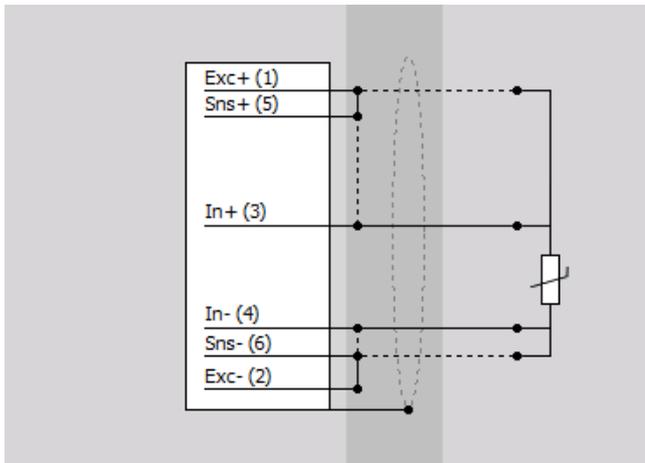
5.15.4.4. STG-L2B10f: Resistance
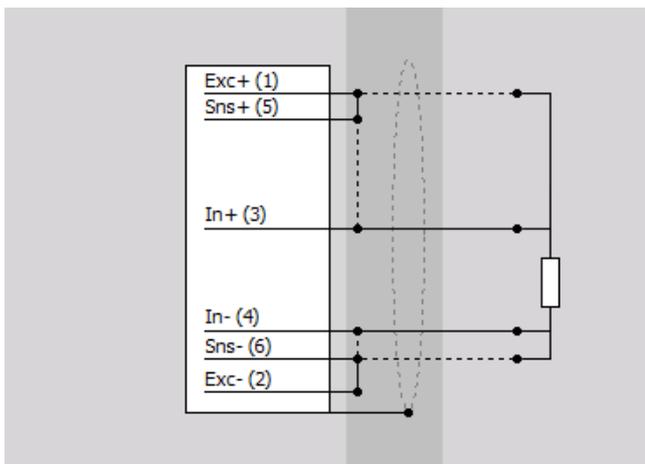
5.15.4.5. STG-L2B10f: Potentiometer
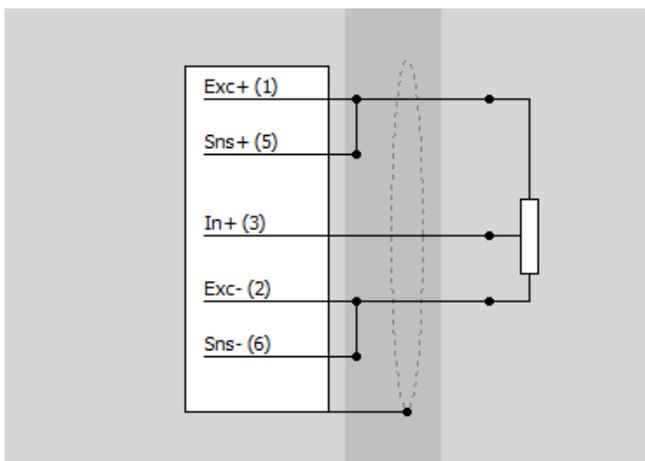
5.15.4.6. STG-L2B10f: Bridge

Full bridge
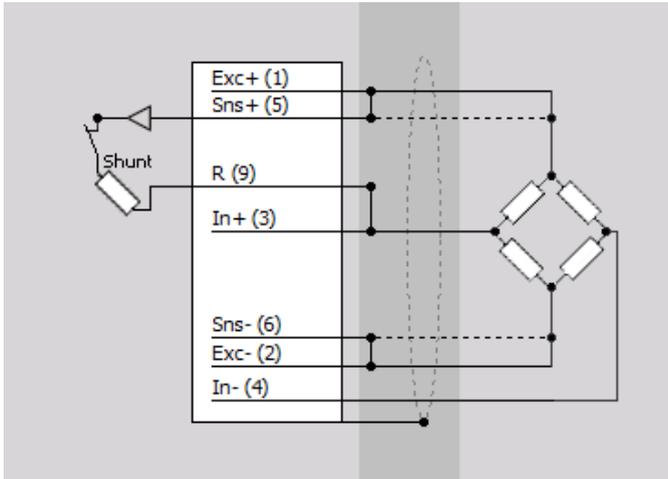
Half bridge
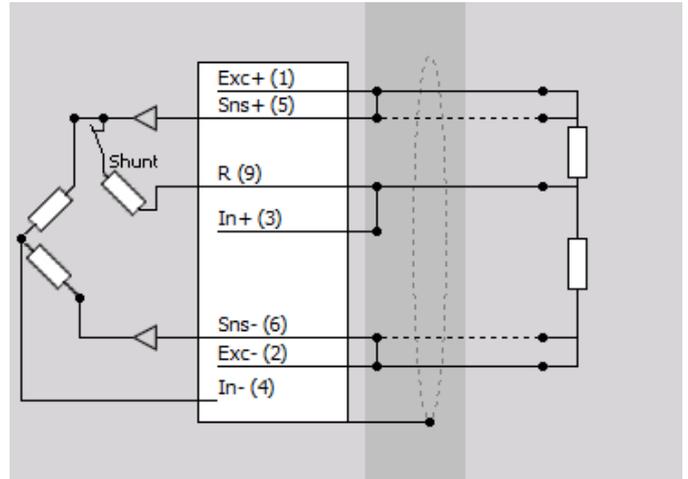
Quarter bridge – 3 wire
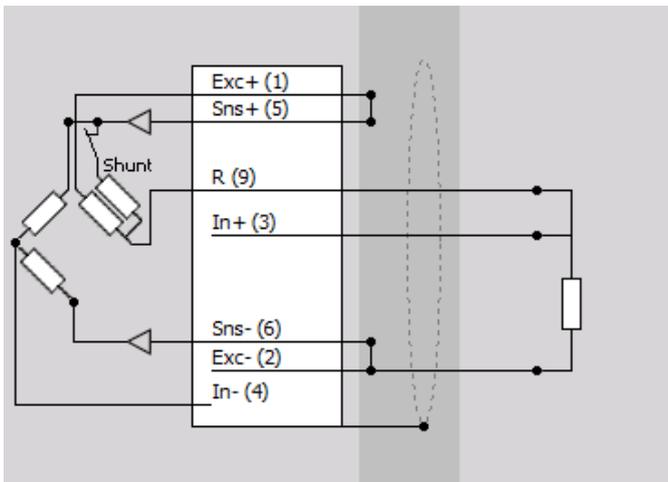
Quarter Bridge – 4 wire
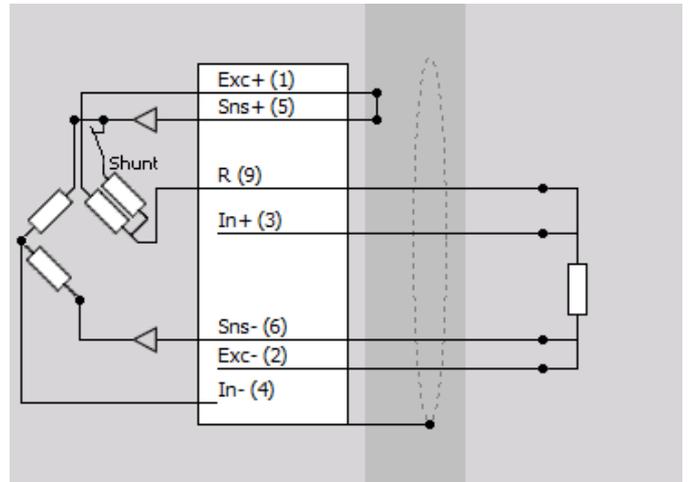
5.15.5. STG-L2B10fs

SIRIUSi-8xSTG-L2B10fs

1: Teds
2: R
3: NC
4: Sns-

9: In-
8: GND
7: Exc+
6: Sns+
5: Exc-
10: In+
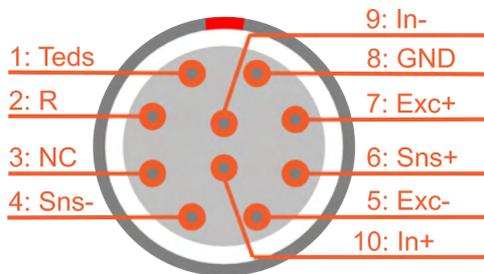
STG-L2B10fs connector: pin-out (10-pin LEMO female)

Mating Connector: FGG.2B.310.CLADxx

Pin	Name	Description
1	Teds	TEDS
2	R	Resistance / SHUNT
3	NC	
4	Sns-	Sense -
5	Exc-	Excitation -
6	Sns+	Sense +
7	Exc+	Excitation +
8	GND	Ground-iso
9	In-	Input -
10	In+	Input +

5.15.5.1. STG-L2B10fs: Voltage

Voltage - Single ended
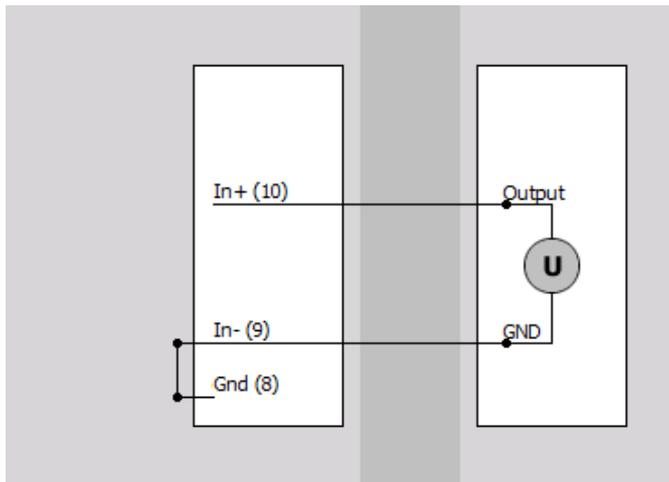
Voltage – Differential
Use only when sensor Output (+) and Output (-) are referenced to Gnd. Gnd must be connected.
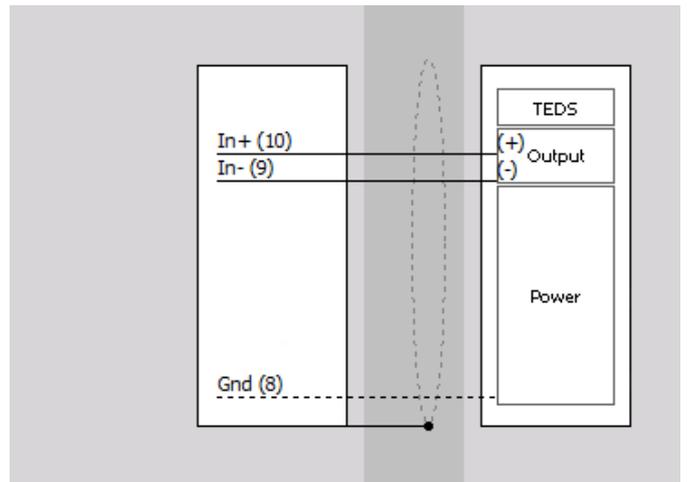
5.15.5.2. STG-L2B10fs: Current

External direct shunt
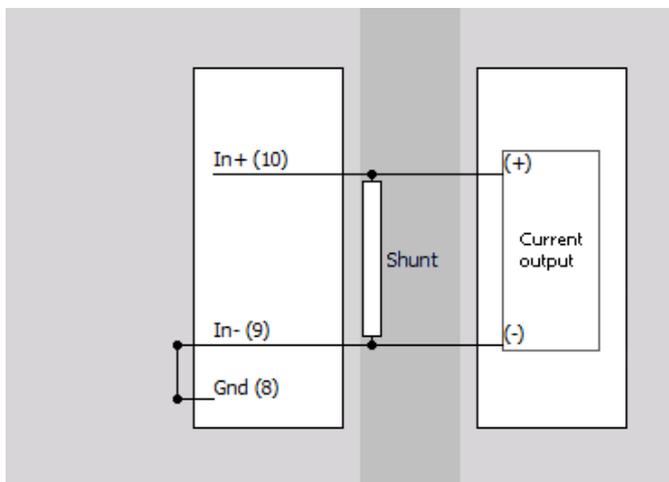
External loop powered shunt
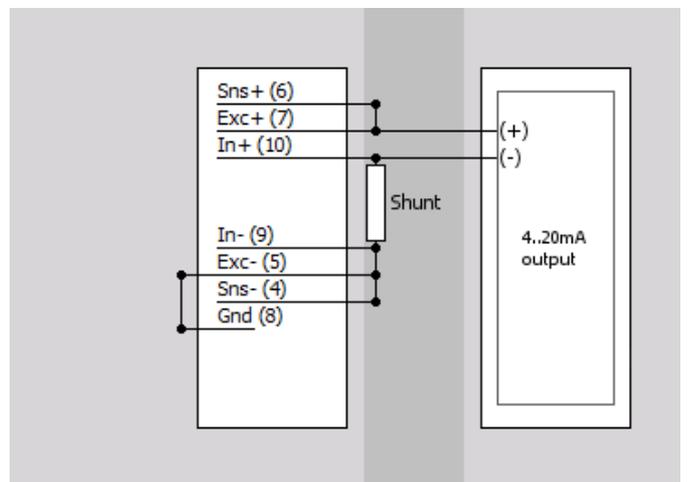
5.15.5.3. STG-L2B10fs: Temperature
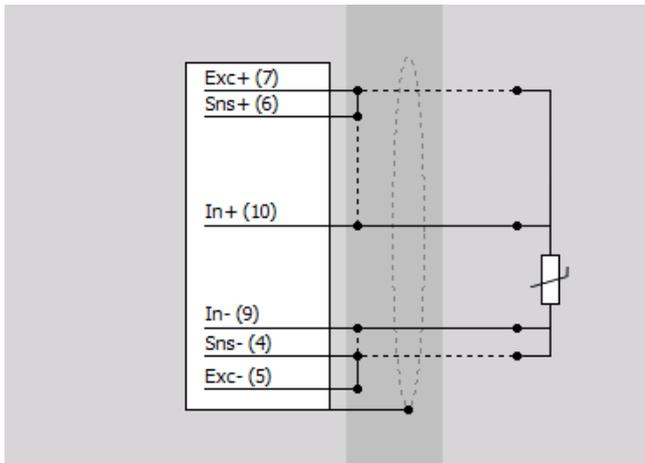
5.15.5.4. STG-L2B10fs: Resistance
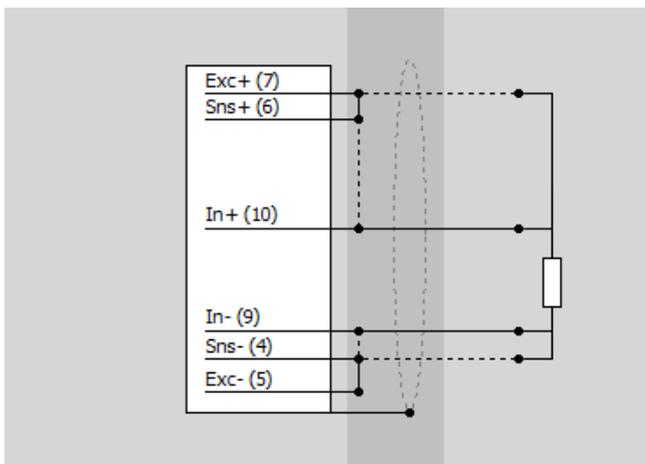
5.15.5.5. STG-L2B10fs: Potentiometer
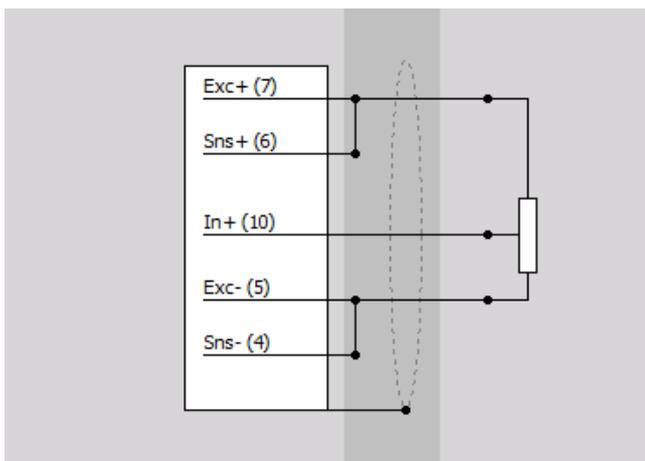
5.15.5.6. STG-L2B10fs: Bridge

Full bridge
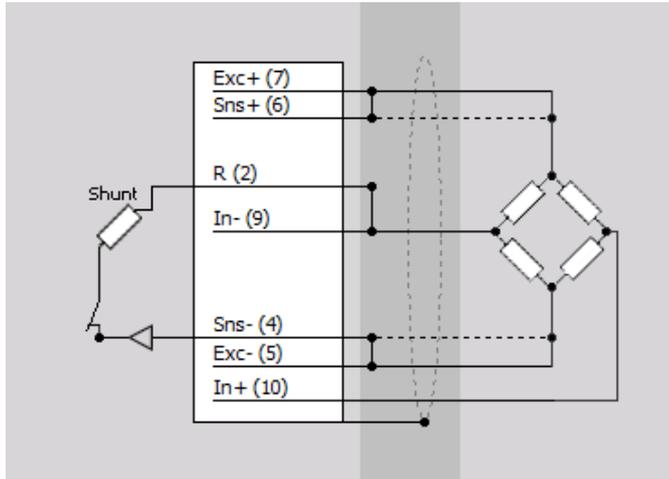
Half bridge
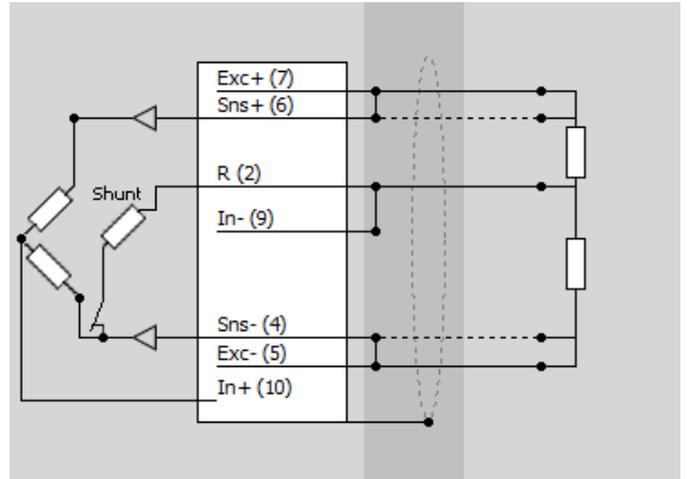
Quarter bridge – 3 wire
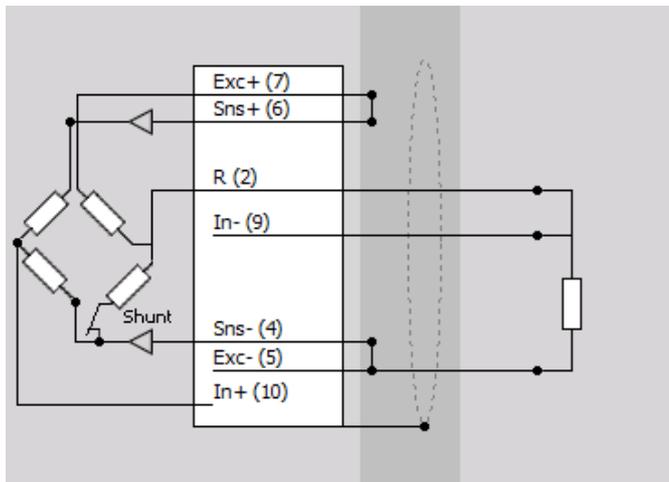
Quarter Bridge – 4 wire

5.15.6. STG+ (Counter)

	7: GND
1: IN0/A	6: +12V
2: IN1/B	5: +5V
3: IN2/Z	4: DO
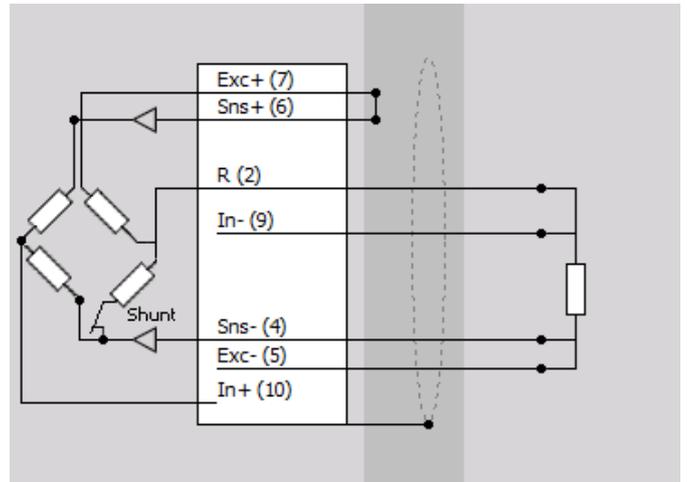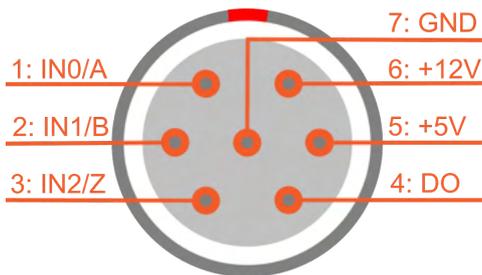
CNT connector: pin-out (7-pin LEMO female)

SIRIUSi 8xSTG+

Connector type L1B7f
Connector on the module: EGG.1B.307.CLL
Mating cable connector: FGG.1B.307.CLAD52

Caution

GND of the counter input is connected to the GND of the analog channel.

Digital output configuration
The "switch" of the open collector output is closed when active.
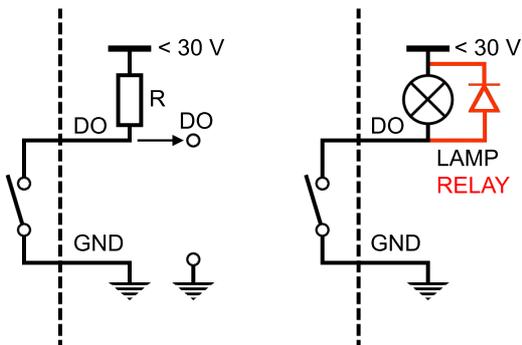
5.16. UNI/UNI+

The UNI module is very similar to the STG module but in comparison to it the UNI module also supports IEPE measurement.

5.16.1. UNI Specifications

Inputs					
Input types	Voltage Full/Half/Quarter bridge strain (120 Ω and 350 Ω) IEPE Potentiometer, RTD, Resistance Current (ext. Shunt)				
ADC Type	24-bit delta-sigma dual core with anti-aliasing filter				
Sampling Rate	Simultaneous 200 kS/sec				
Dual Core Ranges (Low)	**±100 V (±5 V)**	**±10 V (±500 mV)**	**±1 V (±50 mV)**	**±100 mV (±5 mV)**	**±10 mV (±5 mV)**
Gain accuracy	±0.05 % of reading				
Offset accuracy (Dual Core)	±20 (10) mV	±2 (1) mV	±0.2 (0.2) mV	±0.1 (0.1) mV	±0.1 (0.1) mV
Offset Accuracy after Balance Amplifier	±1 mV	±0.1 mV	±0.02 mV	±0.01 mV	±0.01 mV
Typ. Dynamic Range @ 10 kS (Dual Core)	-147 dB (-160 dB)	-147 dB (-165 dB)	-144 dB (-153 dB)	-137 dB (-137 dB)	-117 dB (-117 dB)
Typ. Noise floor @ 10 kS (Dual Core)	-109 dB (-122 dB)	-109 dB (-126 dB)	-108 dB (-114 dB)	-100 dB (-100 dB)	-80 dB (-80 dB)
Typ. CMR @ DC...50 Hz / 400 Hz / 1 kHz	84 / 74 / 67 dB	104 / 103 / 100 dB	112 / 105 / 99 dB	121 / 107 / 98 dB	121 / 107 / 98 dB
Gain Drift	Typical 10 PPM/K, max. 40 PPM/K				
Offset Drift	range ≥ 100 mV: Typical 0.3 μV/K + 2 ppm of range/K, max 0.8 μV/K + 10 ppm of range/K range 10 mV: Typical 0.5 μV/K, max 1.8 μV/K				
Gain Linearity	range ≥ 100 mV: <0.02 % range 10 mV: <0.03 %				
Inter Channel Phase-mismatch	0.02° * fin [kHz] + 0.1° (@ 200 kS/sec)				
Channel Crosstalk	-120 dB @ 10 kHz				
Input Coupling	DC AC 0.3 Hz for 100 V range; AC 0.16 Hz for all other ranges; (1 Hz, 3 Hz, 5 Hz, 10 Hz, 20 Hz per SW)				
Input Impedance	2 MΩ between IN+ and IN- for 100 V Range; all other Ranges > 1 GΩ				
Max. Common Mode Voltage	Isolated version: ±500 V				
	Differential version: 100 V Range: ±120 V; all other Ranges: ±12 V				
Overvoltage Protection	100 V Range: 200 V; all other Ranges: 100 V (200 V peak for 10 msec)				
Excitation Voltage					
Excitation Voltage	Free programmable (16-bit DAC)				
Predefined levels	0, 1, 2.5, 5, 10, 15 and 20 VDC				
Accuracy	±0.05 % ±2 mV				

Drift	±10 ppm/K ±100 µV/K	
Load stability	0 % to 100 % load <0.01 %	
Noise @ 10 V / 350 Ω	<150 µVrms @ 10 kS	
Line regulation over 20 Ω of change	<0.005 % @ 120 Ω load	
Sense Impedance to Exc / to GND	100 kΩ / >100 MΩ	
Current limit	100 mA (max. 800 mW)	
Protection	Continuous short to ground	
Excitation Current		
Excitation Current	Free programmable (16-bit DAC)	
Predefined levels	0.1, 1, 2, 5, 10, 20 and 60 mA DC	
Ranges	0.1 mA - 10 mA	>10 mA - 60 mA
Accuracy	0.05 % ±2 µA	0.1 % ±20 µA
Drift Typical	15 ppm/K	45 ppm/K
Compliance voltage	20 Volt, max. 500 mW	
Output Impedance	>100 MΩ	
Bridge Connection Types		
Bridge types	Full / Half / Quarter bridge (3-wire or 4-wire) / Quarter Constant Current (2-wire or 4-wire)	
Ranges	2 mV/V...1000 mV/V free programmable with Dual Core	
Internal Bridge Completion	Half and Quarter bridge 120 Ω and 350 Ω	
Typ. Bridge Completion Accuracy	0.05 %; TCR: 2 ppm/K (others on request)	
Internal Shunt Resistor	59.88 kΩ, 175 kΩ, software selectable (others on request)	
Typ. Shunt Resistor Accuracy	0.05 %; TCR: 10 ppm/K (others on request)	
Input Short, Sensor Offset Adjust	Software selectable	
IEPE mode		
IEPE Current	Free programmable (16-bit DAC)	
Predefined levels	2, 4, 8, 12, 16 or 20 mA	
Compliance voltage	25 Volt	
Output Impedance	>100 kΩ	
Sensor detection	Shortcut: <4 Volt; Open: >19 Volt	
Counters (only on UNI+ type)		
Inputs	1 digital counter input 3 digital inputs Fully synchronised with analog data Alarm output	
Counter Modes	counting, waveform timing, encoder, tacho, gear-tooth sensor	
General Counter Specifications	See "SIRIUS counter specifications"	
Additional Specifications		
Input connector	DSUB-9, 8-pin LEMO-2B, 10-pin LEMO-2B, 16-pin LEMO-2B (others on request)	
TEDS support	Standard + DSI® adapters	

5.16.2. UNI

SIRIUSi 8xUNI

1: Exc+
2: In+
3: Sns-
4: GND
5: R+
6: Sns+
7: In-
8: Exc-
9: TEDS
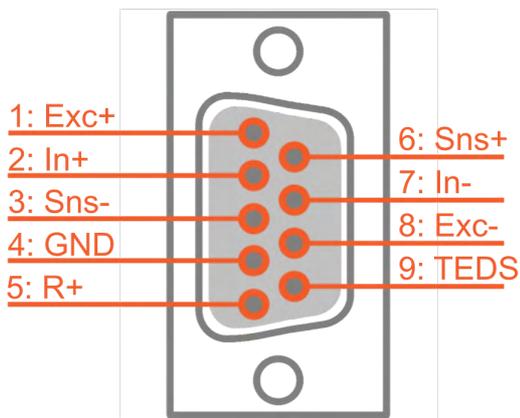
UNI connector: pin-out (DSUB-9 female)

Pin	Name	Description
1	Exc +	Excitation +
2	In+	Input +
3	Sns-	Sense -
4	GND	Ground
5	R+	¼ Bridge/Shunt
6	Sns+	Sense +
7	In-	Input -
8	Exc-	Excitation -
9	TEDS	TEDS

5.16.2.1. UNI: Voltage

Voltage - Single ended
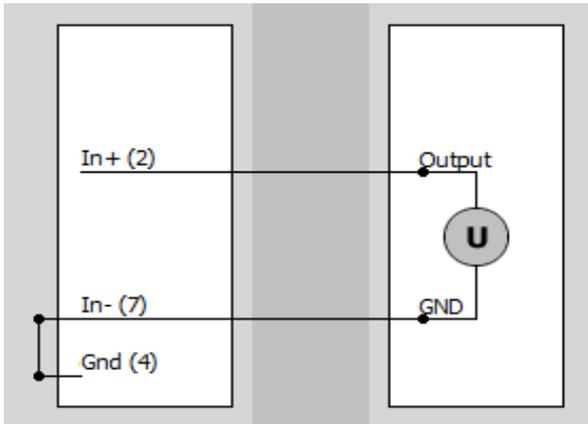
Voltage - Differential
Use only when sensor Output (+) and Output (-) are referenced to Gnd. Gnd must be connected.
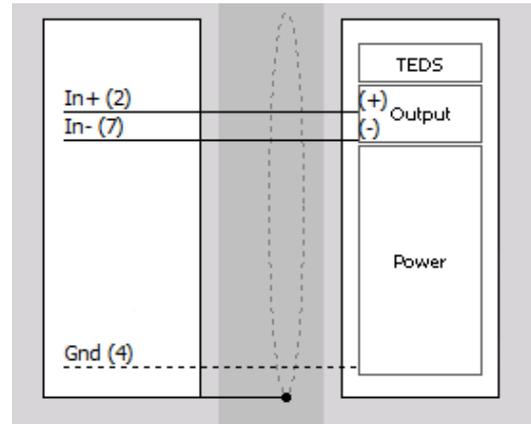
5.16.2.2. UNI: Bridge

Full bridge
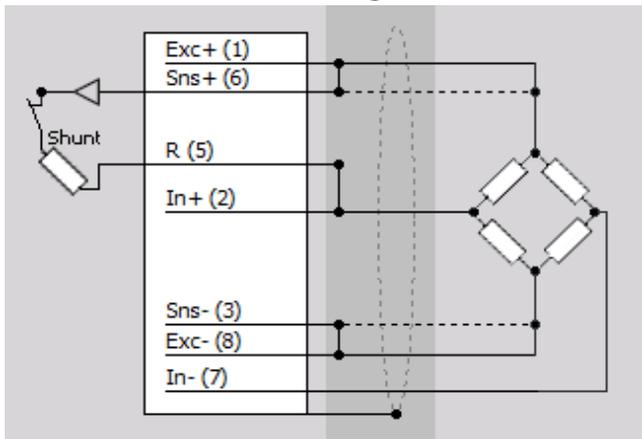
Half bridge
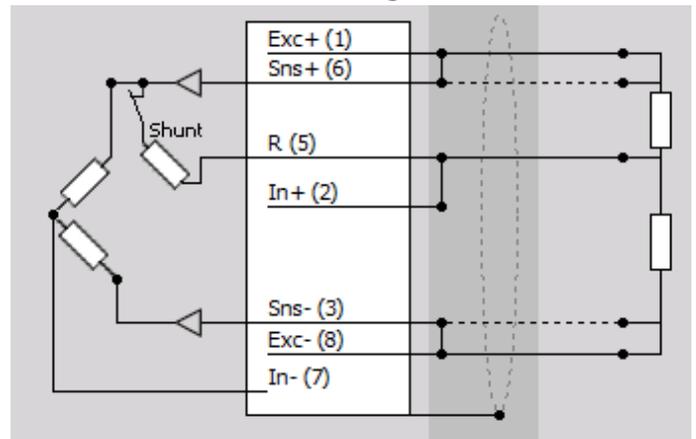
Quarter bridge – 3 wire
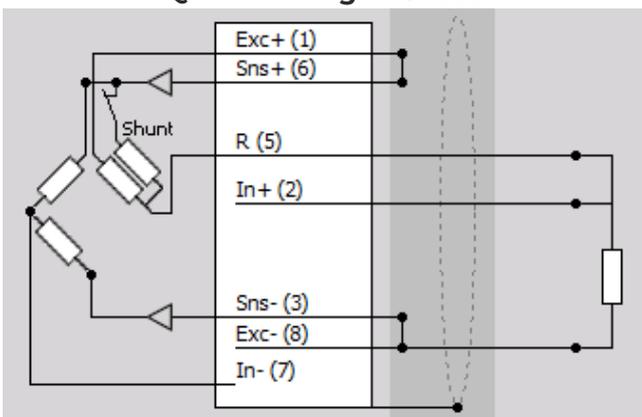
Quarter Bridge – 4 wire
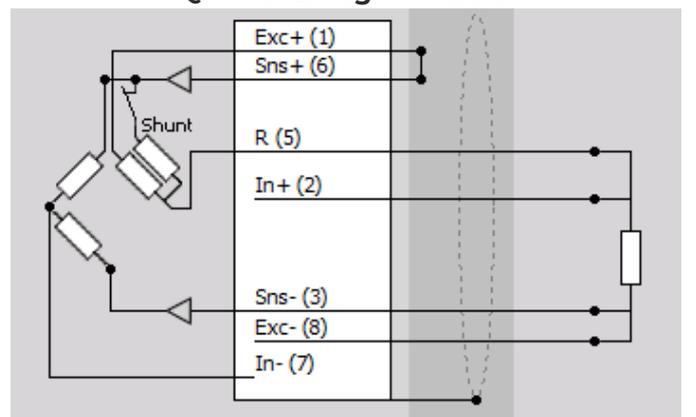
Quarter Bridge – Constant Current
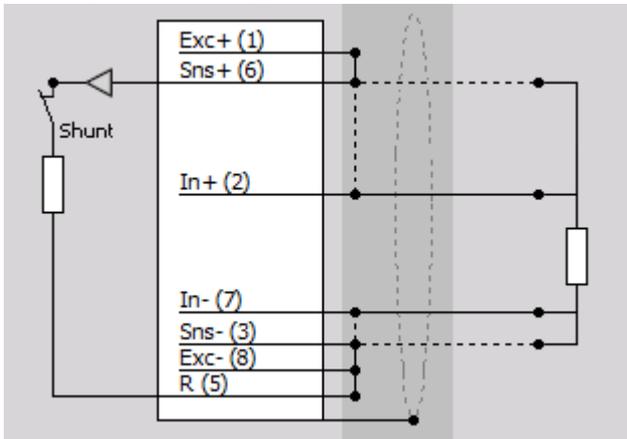
5.16.2.3. UNI: IEPE
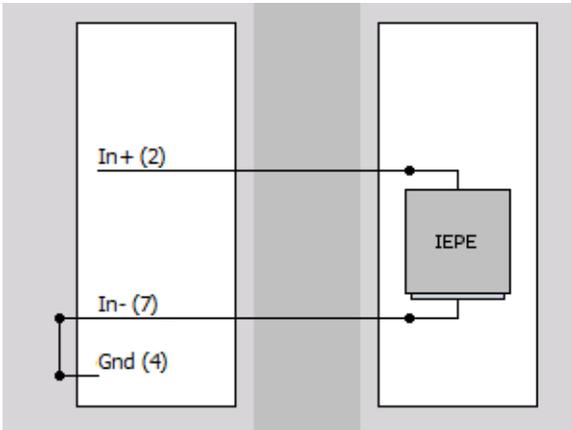
5.16.2.4. UNI: Resistance
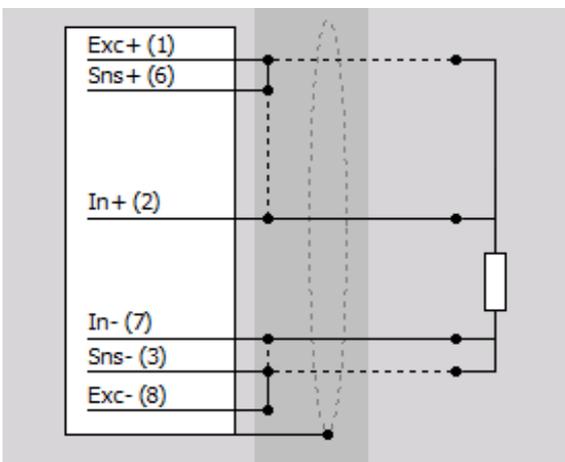
5.16.2.5. UNI: Temperature
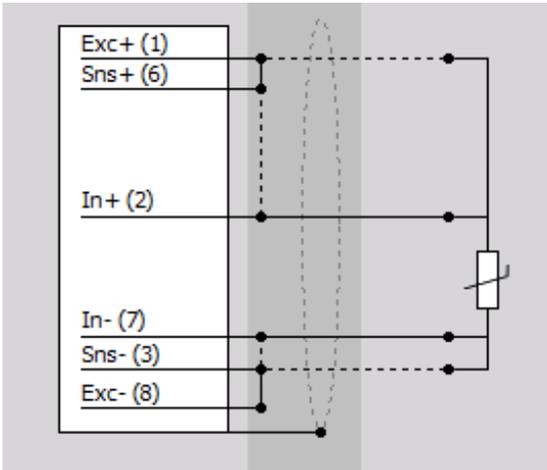
5.16.2.6. UNI: Current

Current - External direct shunt
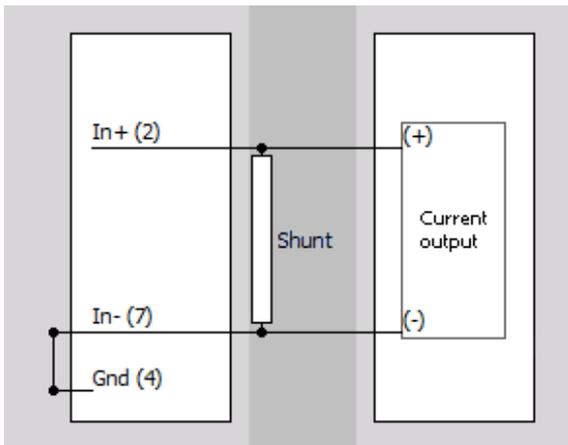
Current - External loop powered shunt
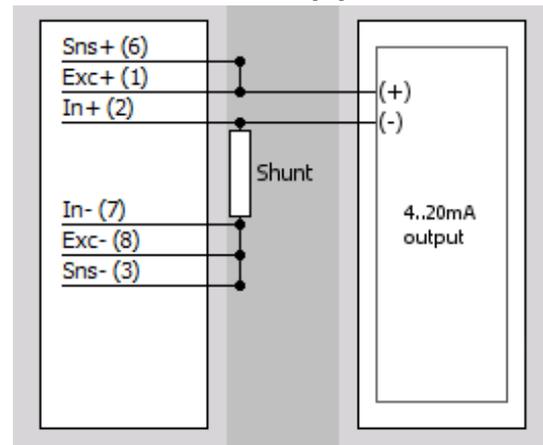
5.16.2.7. UNI: Potentiometer

5.16.3. UNI-L2B10f

1: Exc+
2: Exc-
3: In+
4: In-
9: R+
8: TEDS
7: DI-CNT
6: Sns-
5: Sns+
10: GND
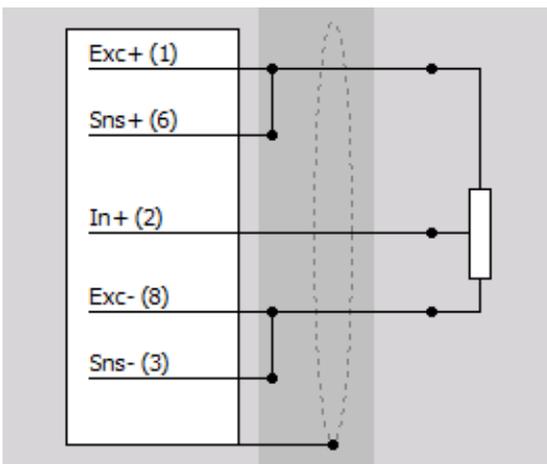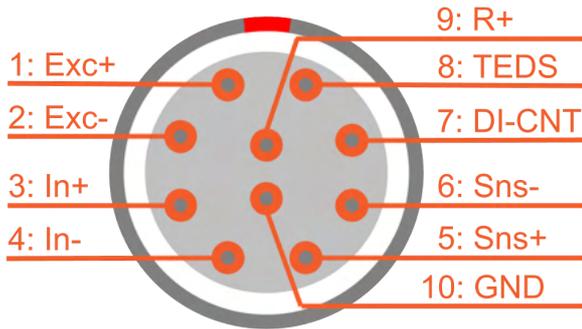
UNI-L2B10f connector: pin-out (10-pin LEMO female)

Mating Connector: FGG.2B.310.CLADxx

Pin	Name	Description
1	Exc +	Excitation +
2	Exc -	Excitation -
3	In+	Input +
4	In-	Input -
5	Sns+	Sense +
6	Sns-	Sense -
7	Di-CNT	Digital I/O, Counter
8	TEDS	TEDS
9	R+/SHUNT	Resistance / SHUNT
10	GND	Ground

5.16.3.1. UNI-L2B10f: Voltage

Voltage - Single ended
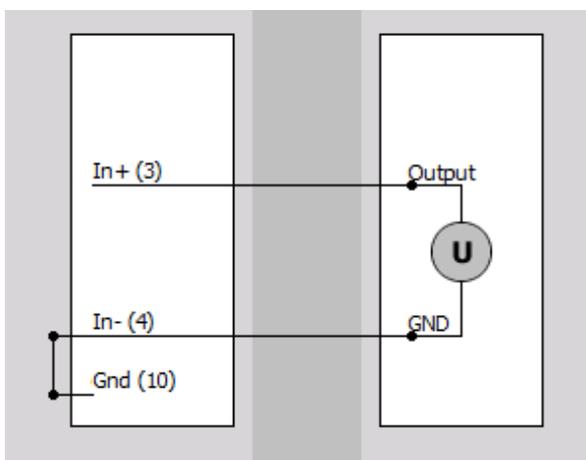
Voltage - Differential

Use only when sensor Output (+) and Output (-) are referenced to Gnd. Gnd must be connected.
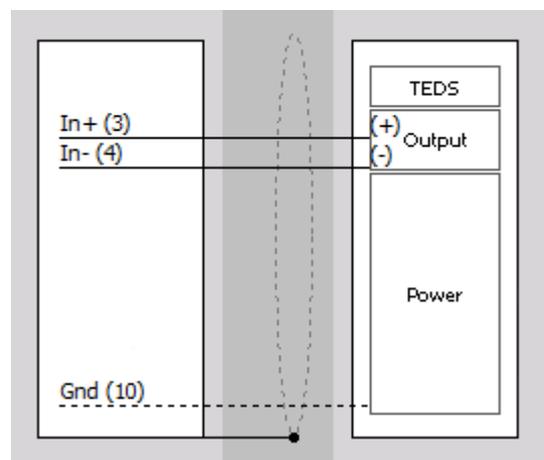
5.16.3.2. UNI-L2B10f: Bridge

Full bridge
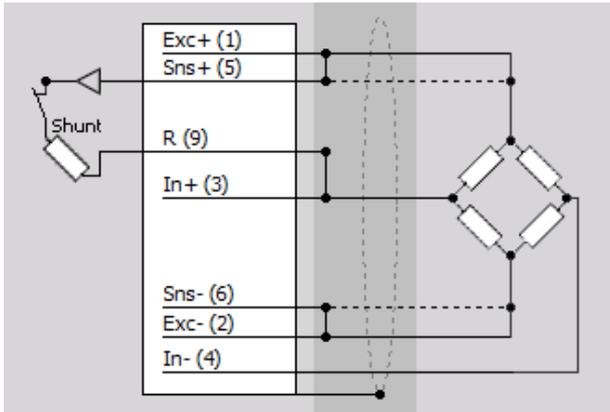
Half bridge
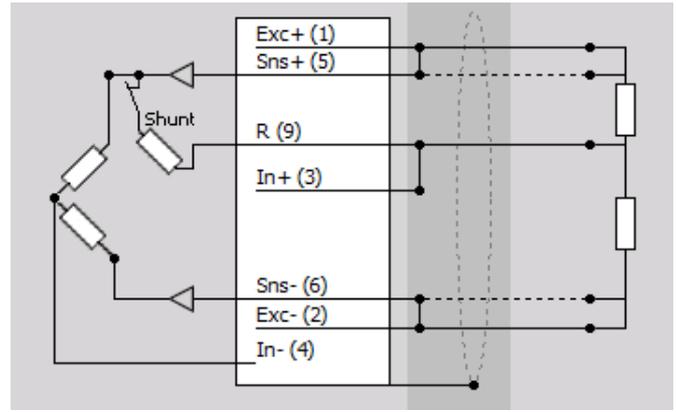
Quarter bridge – 3 wire
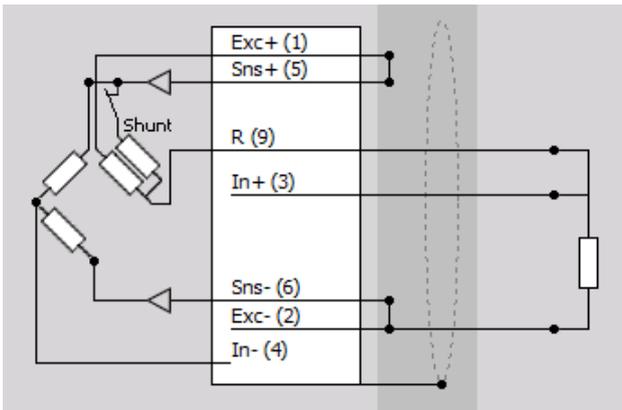
Quarter Bridge – 4 wire
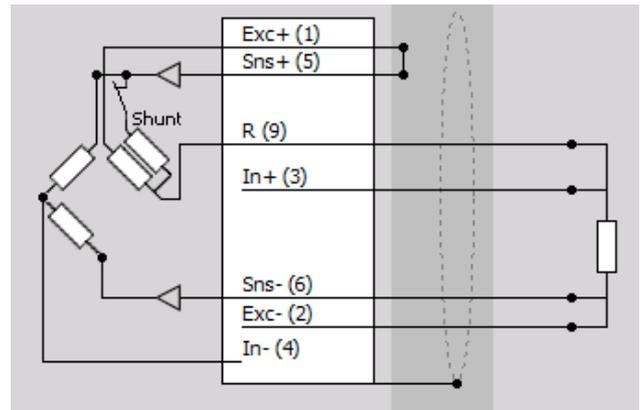
Quarter Bridge – Constant Current
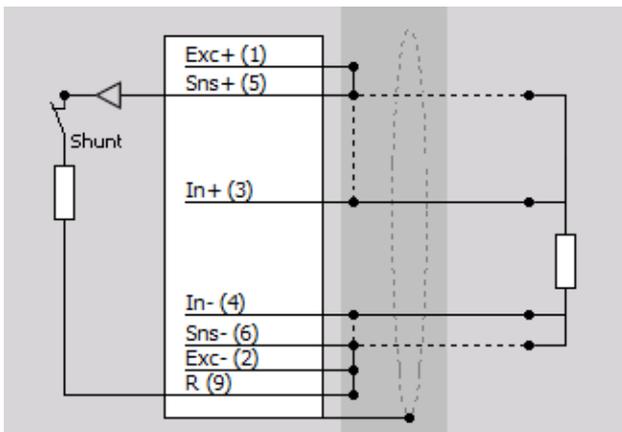
5.16.3.3. UNI-L2B10f: IEPE
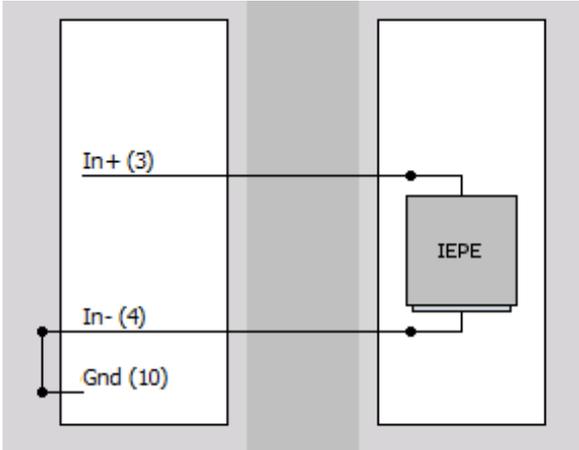
5.16.3.4. UNI-L2B10f: Resistance
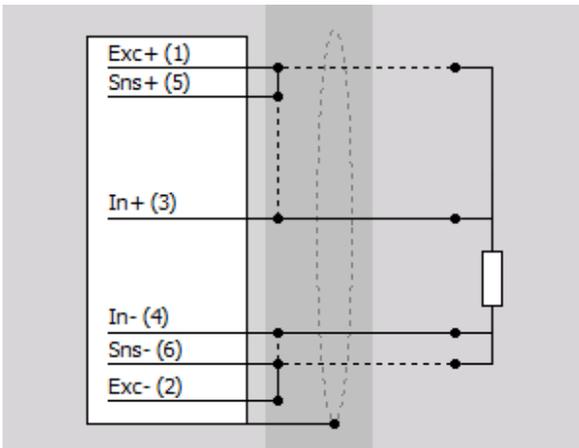
5.16.3.5. UNI-L2B10f: Temperature
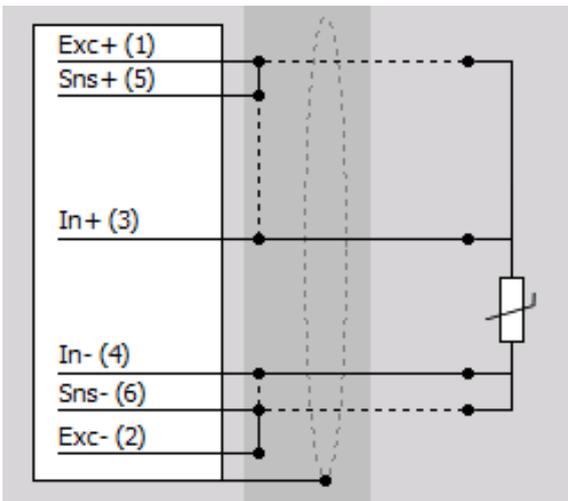
5.16.3.6. UNI-L2B10f: Current

Current - External direct shunt
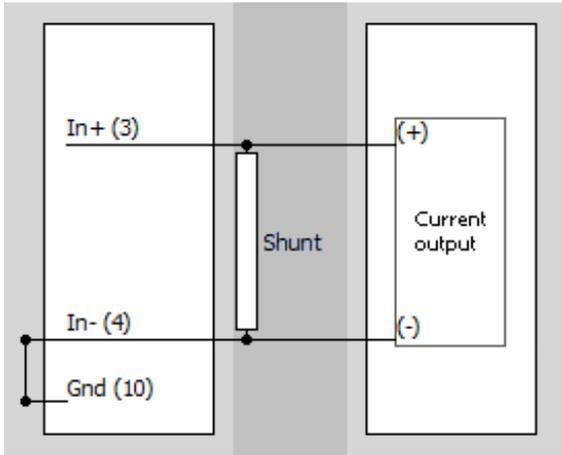
Current - External loop powered shunt
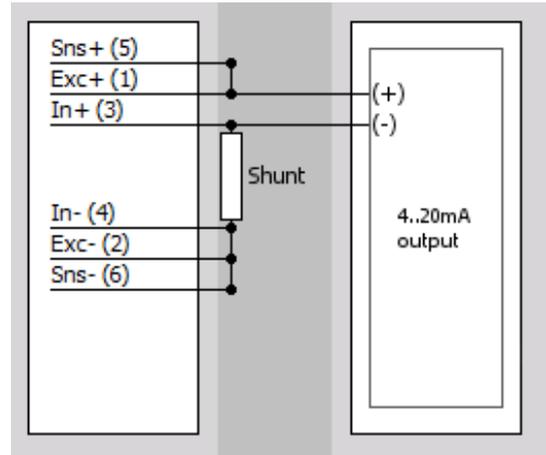
5.16.3.7. UNI-L2B10f: Potentiometer

5.16.4. UNI+ (Counter)

1: IN0/A
2: IN1/B
3: IN2/Z
7: GND
6: +12V
5: +5V
4: DO
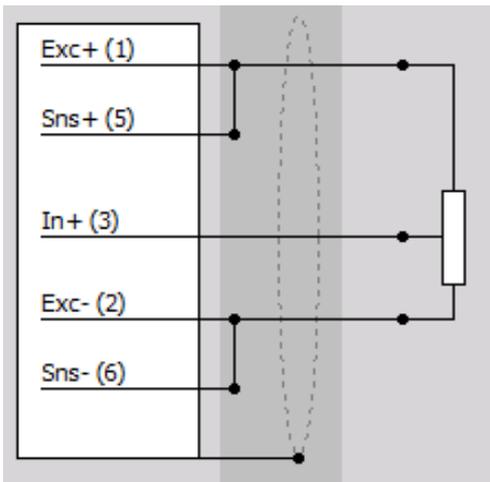
CNT connector: pin-out (7-pin LEMO female)

Connector type L1B7f
Connector on the module: EGG.1B.307.CLL
Mating cable connector: FGG.1B.307.CLAD52

Caution
GND of the counter input is connected to the GND of the analog channel.

Digital output configuration
The "switch" of the open collector output is closed when active.
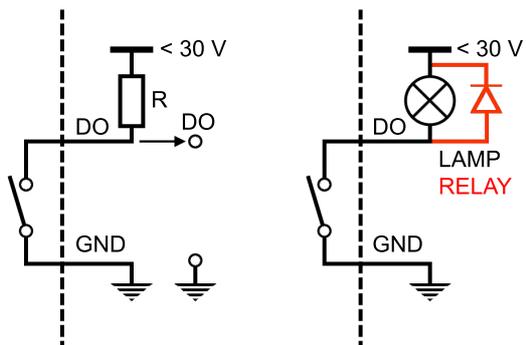
5.17. HD-ACC

The ACC modules are perfect for high-count of sound and vibration IEPE channels.

5.17.1. HD-ACC Specifications

Inputs				
Input types	Voltage IEPE			
ADC Type	Type 24-bit delta-sigma with anti-aliasing filter			
Sampling Rate	Simultaneous 200 kS/sec			
Ranges	**±10 V**	**±5 V**	**±1 V**	**±200 mV**
Gain accuracy	±0.05 % of reading			
Offset accuracy	±2 mV	±1 mV	±0.2 mV	±0.1 mV
Typ. Dynamic Range @ 10 kS	-137 dB	-137 dB	-137 dB	-131 dB
Typ. Noise floor @ 10 kS	-109 dB	-109 dB	-108 dB	-102 dB
Typ. CMR @ 400 Hz / 1 kHz	140 dB / 120 dB			
Gain Drift	Typical 10 PPM/K, max. 30 PPM/K			
Offset Drift	Typical 0.3 µV/K + 5 ppm of range/K, max 2 µV/K + 10 ppm of range/K			
Gain Linearity	<0.02 %			
Inter Channel Phase-mismatch	0.02° * fin [kHz] + 0.1° (@ 200 kS/sec and 10 V Range)			
Channel Cross talk	-150 dB @ 50 Hz; -140 dB @ 1 kHz			
Input Coupling	DC, AC 0.1 Hz, 1 Hz			
Input Impedance	1 MΩ (270 kΩ for AC coupling ≥ 1 Hz) in parallel with 100 pF			
Over-voltage Protection	In+ to In-: 50 V continuous; 200 V peak (10 msec) In- to GND (differential version): 3 Volt			
IEPE mode				
Excitation	4, 8 or 12 mA			
Compliance voltage	22 Volt			
Output Impedance	>100 kΩ			
Sensor detection	Shortcut: <4 Volt; Open: >10 Volt			
Additional Specifications				
Input connector	BNC			
TEDS support	IEPE mode only			
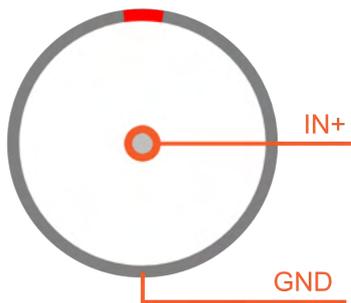
5.17.2. HD-ACC

HD-ACC connector: pin-out (BNC)

SIRIUSi-HD-16xACC

5.17.2.1. HD-ACC: Voltage, IEPE

Voltage

IEPE
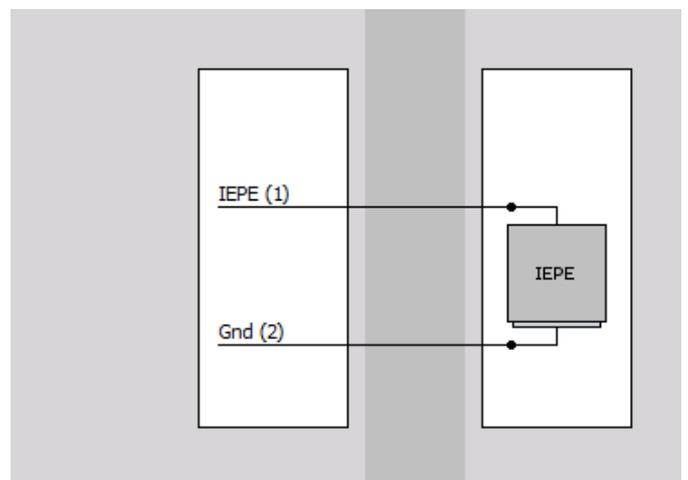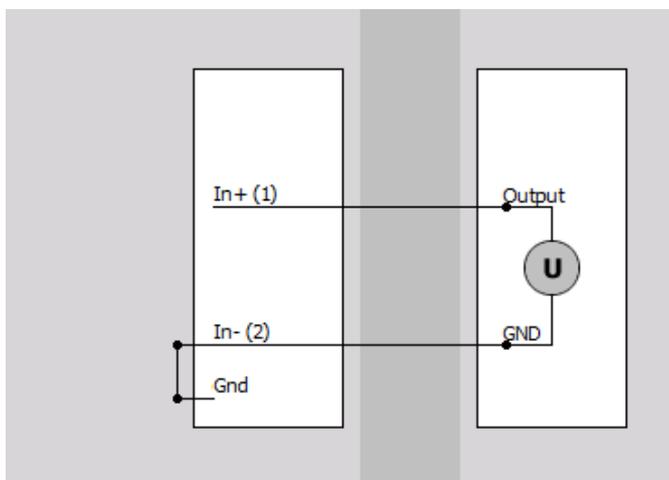
5.18. HD-LV

The LV modules are perfect for high-count low voltage and current measurements in combination with current clamps.

5.18.1. HD-LV: Specifications

Inputs				
Input types	Voltage Full bridge strain Current (ext. Shunt)			
ADC Type	Type 24-bit delta-sigma with anti-aliasing filter			
Sampling Rate	Simultaneous 200 kS/sec			
Ranges	**±100 V**	**±10 V**	**±1 V**	**±100 mV**
Gain accuracy	±0.05 % of reading			
Offset accuracy	± 20 mV	± 2 mV	± 0.2 mV	± 0.1 mV
Dynamic Range @ 10 kS	-134 dB	-137 dB	-137 dB	-125 dB
Typ. Noise floor @ 10 kS	-104 dB	-104 dB	-104 dB	-95 dB
Typ. CMR @ 400 Hz / 1 kHz	74 / 70 dB	86 / 84 dB	96 / 95 dB	112 / 102 dB
Gain Drift	Typical 10 PPM/K, max. 40 PPM/K			
Offset Drift	Typical 0.3 µV/K + 5 ppm of range/K, max 2 µV/K + 10 ppm of range/K			
Gain Linearity	<0.02 %			
Inter Channel Phase-mismatch	0.02° * fin [kHz] + 0.1° (@ 200 kS/sec and 10 V Range)			
Channel Cross talk	-120 dB @ 10 kHz (Range ≤10 V); -76 dB @ 1 kHz (Range = 100 V)			
Input Coupling	DC			
Input Impedance	1 MΩ for 100 V Range; all other Ranges 10 MΩ			
Max. common mode voltage	100 V Range: ±100 V; all other Ranges: ±12 V			
Overvoltage Protection	In+ to In-: 100 V Range: 200 V; all other Ranges: 50 V (200 V for 10 msec)			
Excitation Voltage				
Excitation Voltage	Unipolar or Bipolar Software selectable Free programmable (16-bit DAC)			
Excitation Level unipolar	0...24 Volt; Predefined levels: 1, 2.5, 5, 10, 12, 15, 20 and 24 VDC			
Excitation Level bipolar	2...30 Volt; Predefined levels: 2.5, 5, 10, 12, 15, 24 and 30 VDC			
Accuracy	±0.1 % ±5 mV			
Drift	±50 ppm/K ±100 µV/K			
Stability 10 % to 90 % load	<0.01 %			
Current limit	100 mA (1 Watt max. per Channel, 12 Watt max. per Slice)			
Protection	Continuous short to ground			
Bridge Connection Types	Full bridge			
Ranges @ 10 VExc	2 mV/V...1000 mV/V free programmable			
Sensor Offset Adjust	Software selectable			

Additional Specifications	
Input connector	DSUB-9, BNC (others on request)
TEDS support	Standard + DSI® adapters

5.18.2. HD-LV

SIRIUSi-HD-16xLV
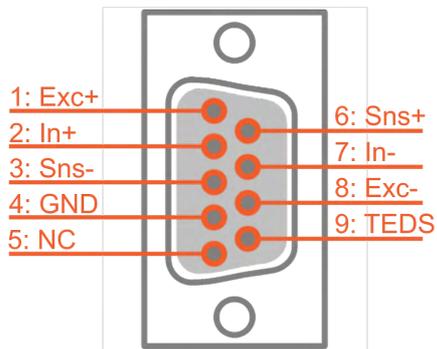
,

HD-LV connector: pin-out (DSUB-9 female)

1: Exc+
2: In+
3: Sns-
4: GND
5: NC
6: Sns+
7: In-
8: Exc-
9: TEDS

Pin	Name	Description
1	Exc +	Excitation +
2	In+	Input +
3	Sns-	Sense -
4	GND	Ground
5	NC	Not connected
6	Sns+	Sense +
7	In-	Input -
8	Exc-	Excitation -
9	TEDS	TEDS

Caution

DSUB-9 mating connector backshells shall be no more than 15.0 mm wide in order to populate all 16 channels at once.

5.18.2.1. HD-LV: Voltage

Voltage - Single ended
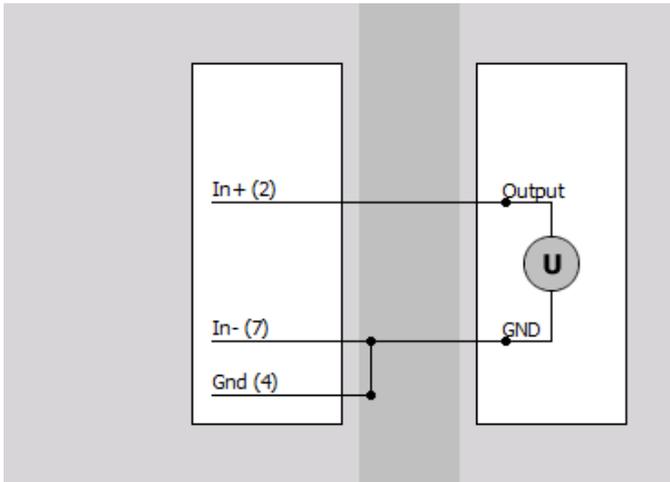
Voltage – Differential
Use only when sensor Output (+) and Output (-) are referenced to Gnd. Gnd must be connected.
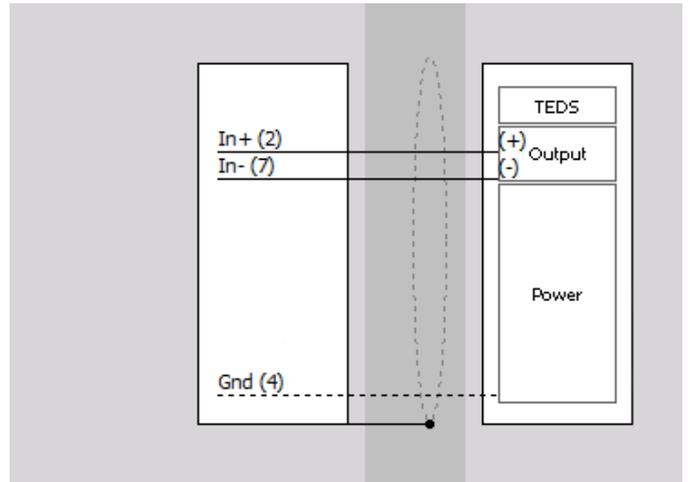
5.18.2.2. HD-LV: Current

External direct shunt
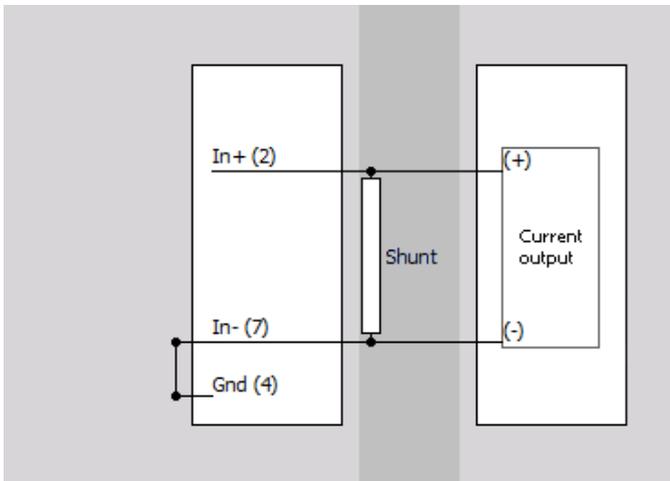
External loop powered shunt
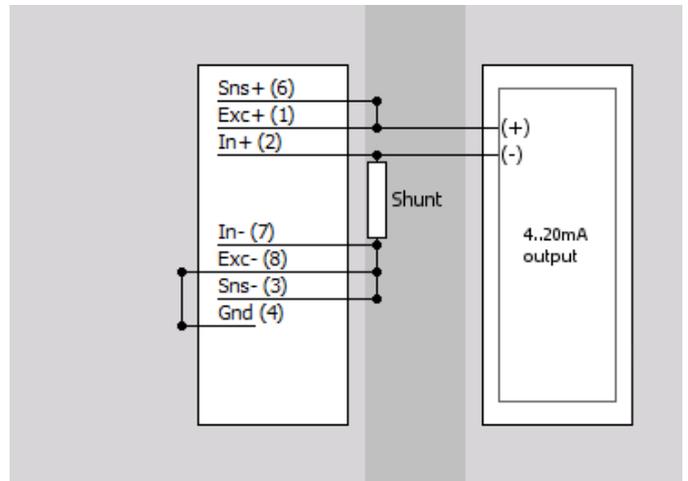
5.18.2.3. HD-LV: Bridge

Full Bridge

5.18.3. HD-LV-BNC

IN+

IN-
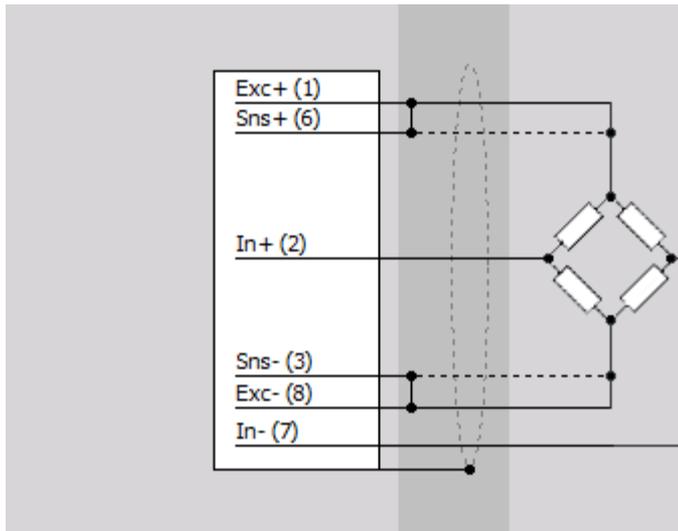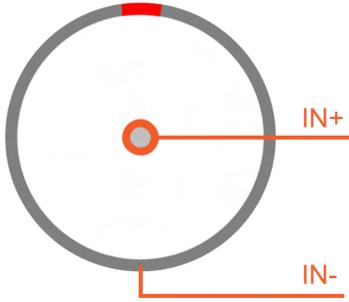
LV-BNC connector: pin-out (BNC)

SIRIUSi-HD-16xLV-BNC

5.18.3.1. HD-LV-BNC: Voltage, Current
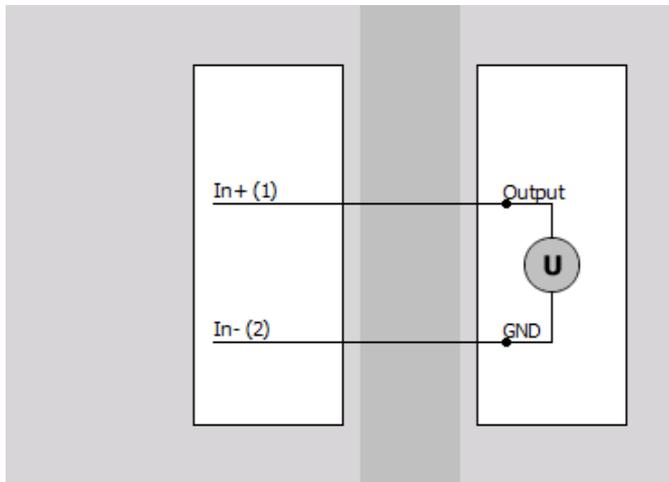
Voltage

Current
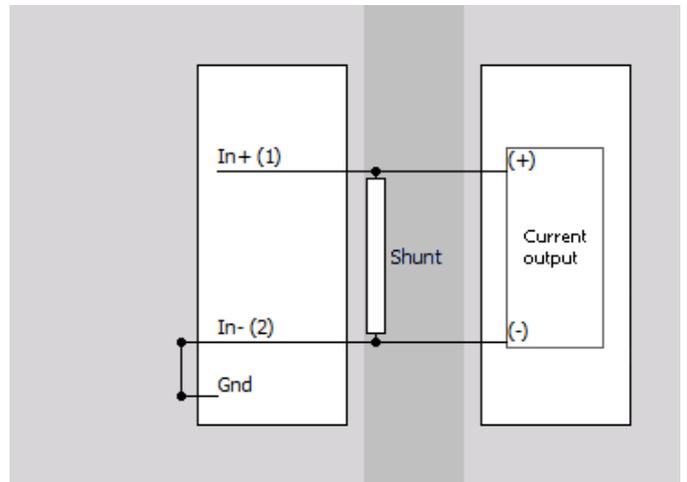
5.19. HD-STGS

The STGS module is a universal amplifier perfectly fitting for high-count strain gauge and voltage measurements.

Hint
Internally, potentiometer mode is actually a half-bridge connection. Pin IN- is connected to the half-bridge point.

5.19.1. HD-STGS: Specification

| Inputs				
Input types	Voltage Full/Half/Quarter bridge strain (120 Ω and 350 Ω) Potentiometer Current (ext. Shunt)			
ADC Type	24-bit delta-sigma with anti-aliasing filter			
Sampling Rate Simultaneous	200 kS/sec			
Ranges	**±10 V**	**±1 V**	**±100 mV**	**±10 mV**
Gain Accuracy	±0.05 % of reading			
Offset Accuracy	±2 mV	±0.2 mV	±0.1 mV	±0.1 mV
Offset Accuracy after Balance Amplifier	±0.2 mV	±0.02 mV	±0.01 mV	±0.01 mV
Dynamic Range @ 10 kS	-137 dB	-137 dB	-130 dB	-112 dB
Typ. Noise floor @ 10 kS	-105 dB	-104 dB	-95 dB	-75 dB
Typ. CMR @ 400 Hz / 1 kHz	86 / 84 dB	96 / 95 dB	112 / 102 dB	112 / 102 dB
Gain Drift	Typical 10 PPM/K, max. 40 PPM/K			
Offset Drift	Typical 0.3 µV/K + 5 ppm of range/K, max 2 µV/K + 10 ppm of range/K			
Gain Linearity	<0.02 %			
Inter Channel Phase-mismatch	0.02° * fin [kHz] + 0.1° (@ 200 kS/sec)			
Channel Cross talk	-120 dB @ 10 kHz			
Input Coupling	DC			
Input Impedance	10 MΩ			
Max. common mode voltage	±12 V			
Overvoltage Protection	In + to In-: 50 V continuous; 200 V peak (10 msec)			
Excitation Voltage				
Excitation Voltage	Free programmable (16-bit DAC)			
Predefined levels	0, 1, 2.5, 5, 10 and 12 VDC			
Accuracy	±0.05 % ±2 mV			
Drift	±50 ppm/K ±100 µV/K			
Stability 10 % to 90 % load	<0.01 %			
Current limit	45 mA (350 mW max. power)			
Protection	Continuous short to ground			
Bridge Connection Types				
Bridge types	Full / Half / Quarter bridge (3-wire)			
Ranges	2 mV/V...1000 mV/V free programmable			

Internal Bridge Completion	½ bridge and ¼ bridge 120 Ω and 350 Ω
Bridge Completion Accuracy	0.05 %; TCR: 5 ppm/K (others on request)
Internal Shunt Resistor	100 kΩ (others on request)
Maximum sensor resistance	5 kΩ for Full and Half bridge measurements
Typ. Shunt Resistor Accuracy	0.05 %; TCR: 10 ppm/K (others on request)
Input Short, Sensor Offset Adjust	Software selectable
Additional Specifications	
Input connector	DSUB-9
TEDS support	Standard + DSI® adapters

5.19.2. HD-STGS

SIRIUSi-HD-16xSTGS
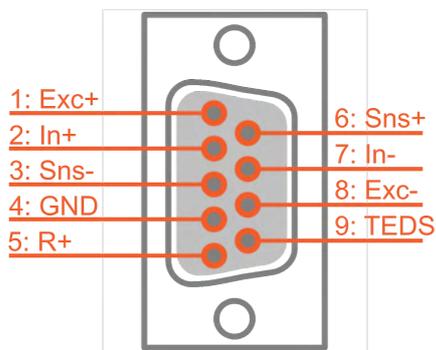
HD-STGS connector: pin-out (DSUB-9 female)

Pin	Name	Description
1	Exc +	Excitation +
2	In+	Input +
3	Sns-	Sense -
4	GND	Ground
5	R+	¼ Bridge/Shunt
6	Sns+	Sense +
7	In-	Input -
8	Exc-	Excitation -
9	TEDS	TEDS

> ⚠️ **Caution**
> DSUB-9 mating connector backshells shall be no more than 15.0 mm wide in order to populate all 16 channels at once

## 5.19.2.1. HD-STGS: Voltage

Voltage - Single ended
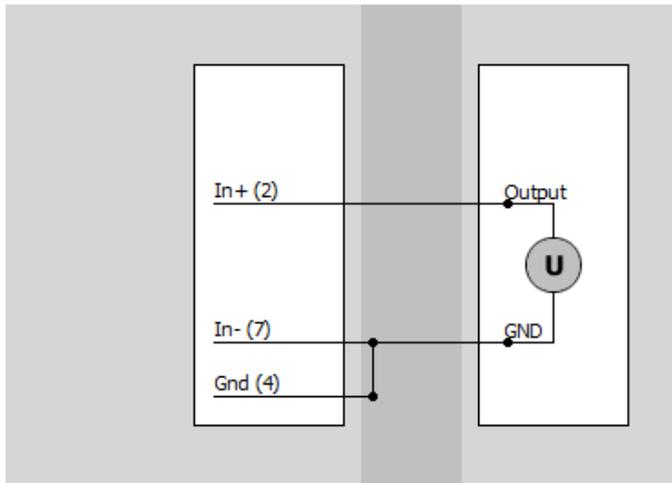
Voltage – Differential
Use only when sensor Output (+) and Output (-) are referenced to Gnd. Gnd must be connected.
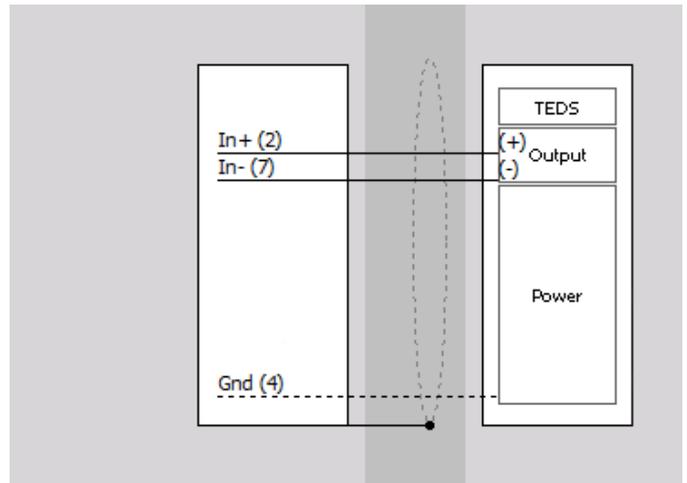

5.19.2.2. HD-STGS: Current

**External direct shunt**
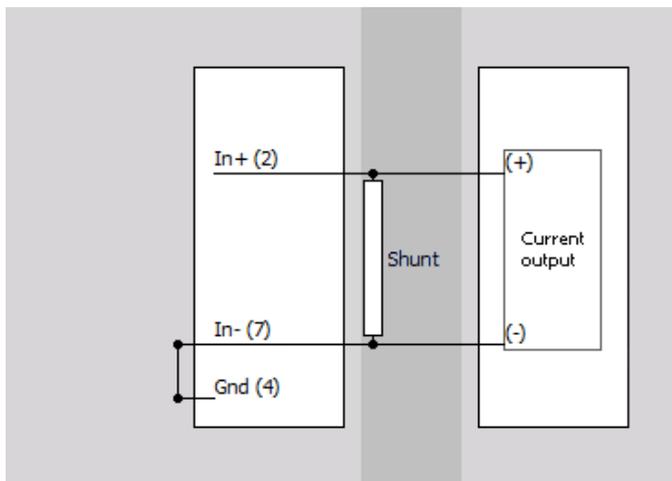
External loop powered shunt
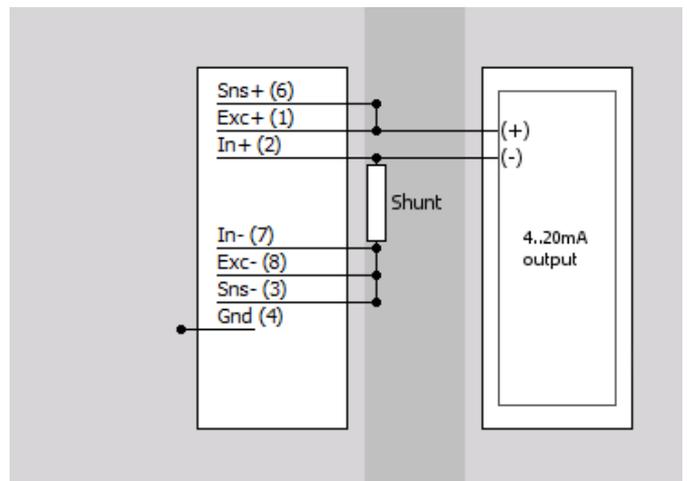
5.19.2.3. HD-STGS: Potentiometer
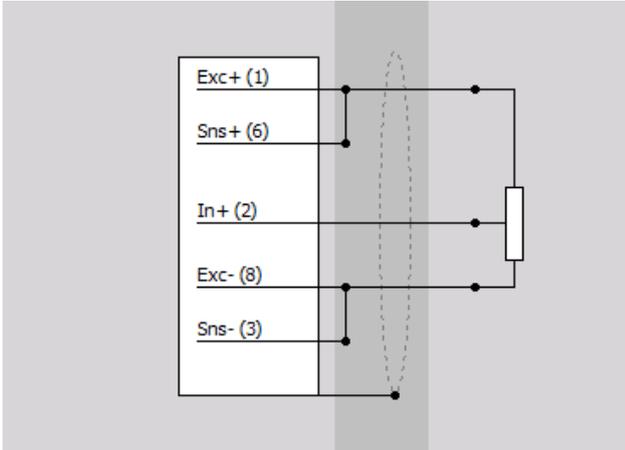
5.19.2.4. HD-STGS: Bridge

Full bridge
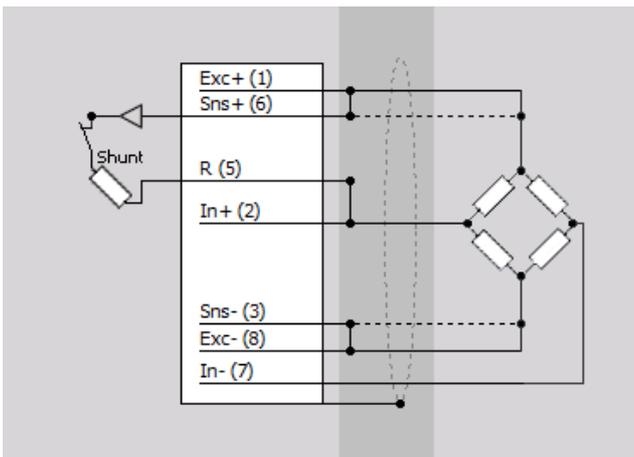
Half bridge
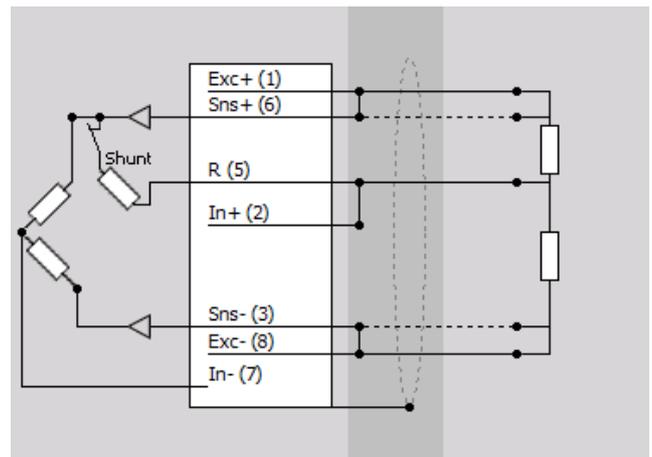
Quarter bridge – 3 wire
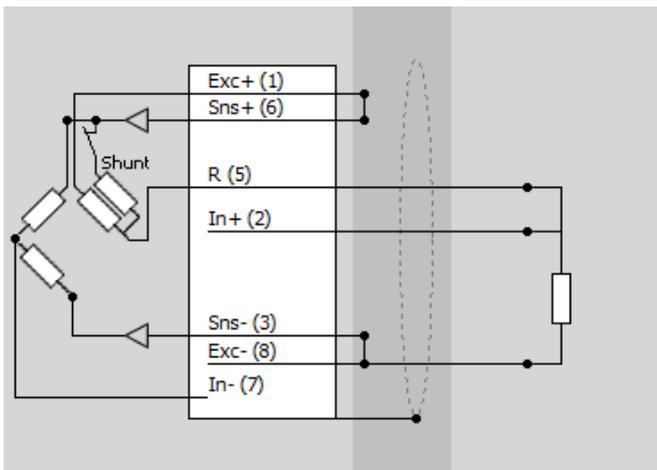
5.19.2.4.1. HD-STGS: Bridge

Bridge range	Set excitation	Accuracy
2 mV/V	1 V	0.057 % of reading + 100 uV/V
20 mV/V	1 V	0.11 % of reading + 100 uV/V
200 mV/V	1 V	0.2 % of reading + 200 uV/V
1000 mV/V	1 V	0.24 % of reading + 200 uV/V
2 mV/V	2.5 V	0.055 % of reading + 40 uV/V
20 mV/V	2.5 V	0.082 % of reading + 40 uV/V
200 mV/V	2.5 V	0.12 % of reading + 80 uV/V
1000 mV/V	2.5 V	0.11 % of reading + 800 uV/V
2 mV/V	5 V	0.054 % of reading + 20 uV/V
20 mV/V	5 V	0.075 % of reading + 20 uV/V
200 mV/V	5 V	0.094 % of reading + 40 uV/V
1000 mV/V	5 V	0.088 % of reading + 400 uV/V
2 mV/V	10 V	0.055 % of reading + 10 uV/V
20 mV/V	10 V	0.066 % of reading + 20 uV/V
200 mV/V	10 V	0.066 % of reading + 200 uV/V
1000 mV/V	10 V	0.079 % of reading + 200 uV/V
2 mV/V	12 V	0.055 % of reading + 8.4 uV/V
20 mV/V	12 V	0.066 % of reading + 17 uV/V
200 mV/V	12 V	0.066 % of reading + 170 uV/V
1000 mV/V	12 V	0.078 % of reading + 170 uV/V

5.19.3. HD-STGS-L1B10f

SIRIUSi-HD-16xSTGS-L1B10f

9: Shield
8: Sns-
7: Exc-
6: GND
5: Exc+
10: TEDS

1: In-
2: Sns+
3: R+
4: In+
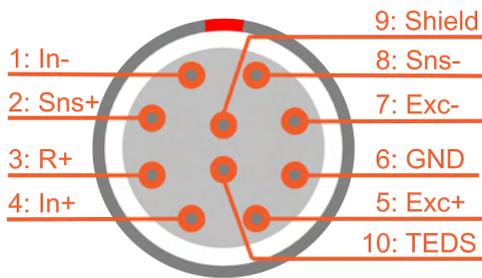
HD-STGS-L1B10f connector: pin-out (10-pin LEMO female)

SIRIUS Connector: EEG.1B.310.CLN
Mating Connector: FGG.1B.310.CLADxx

| Pin	Name	Description
1	In-	Input -
2	Sns+	Sense +
3	R+	¼ Bridge/Shunt
4	In+	Input +
5	Exc +	Excitation +
6	GND	Measurement GND
7	Exc -	Excitation -
8	Sns-	Sense -
9	Shield	connection to chassis
10	TEDS	TEDS

5.19.3.1. HD-STGS-L1B10f: Voltage

Voltage - Single ended
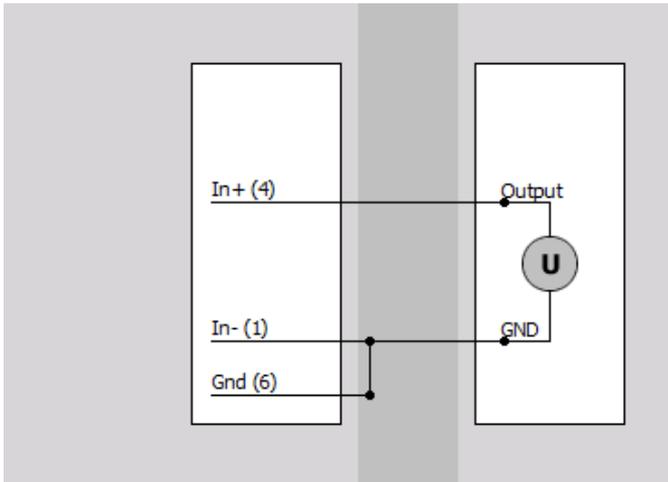
Voltage – Differential
Use only when sensor Output (+) and Output (-) are referenced to Gnd. Gnd must be connected.
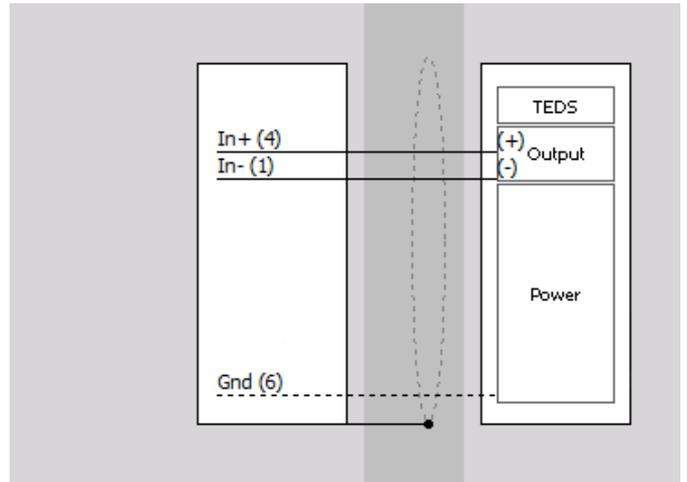
## 5.19.3.2. HD-STGS-L1B10f: Current

External direct shunt
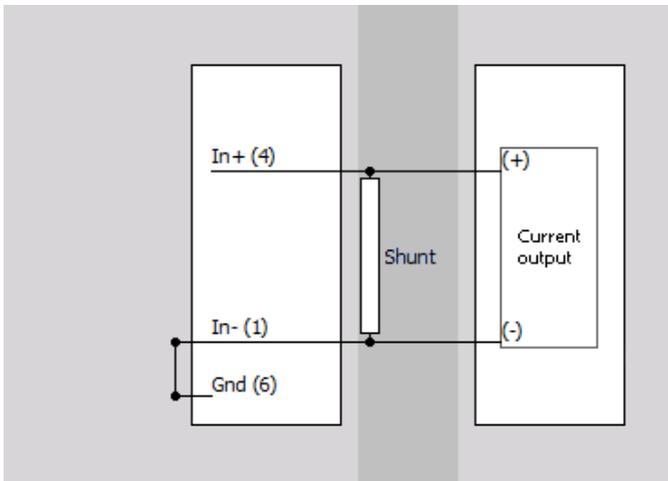
External loop powered shunt
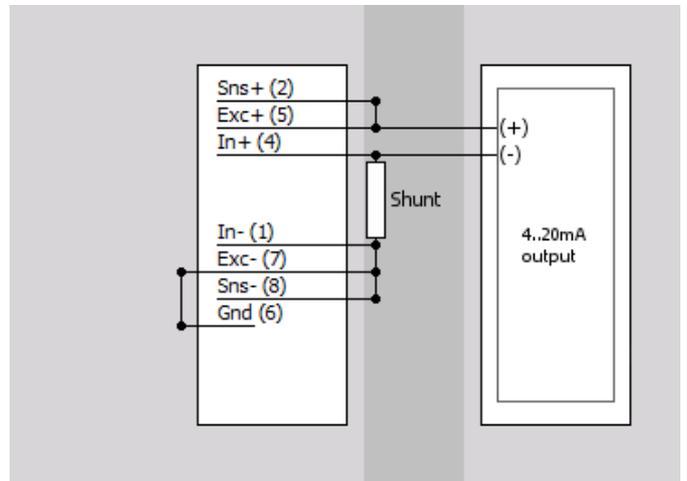
5.19.3.3. HD-STGS-L1B10f: Potentiometer
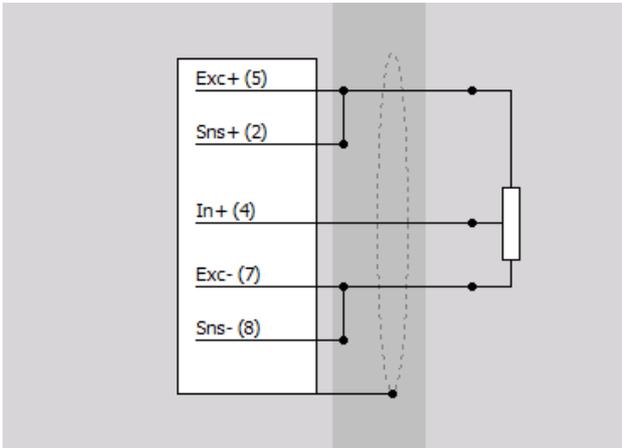
5.19.3.4. HD-STGS-L1B10f: Bridge

Full bridge
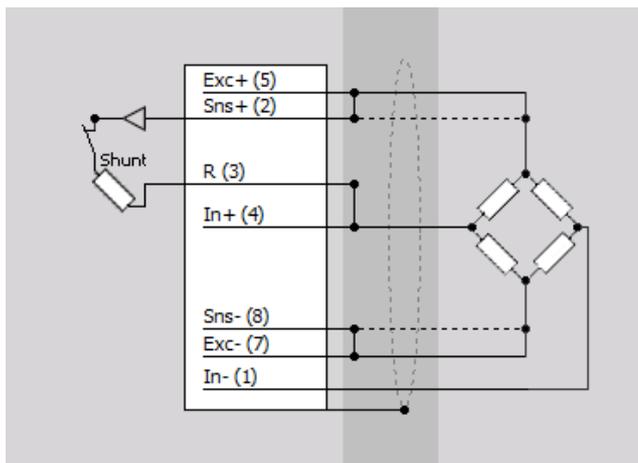
Half bridge
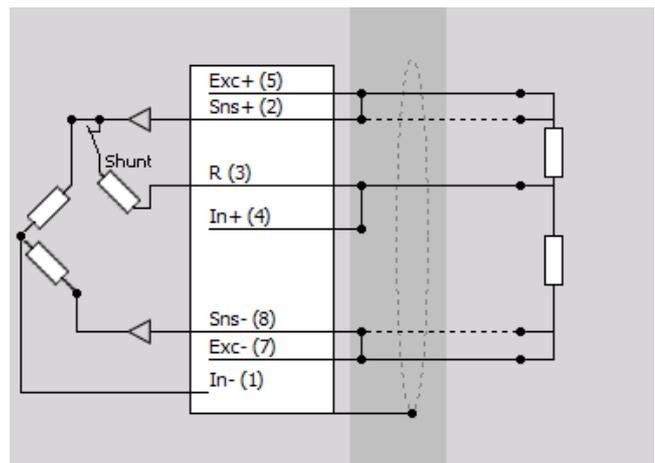
Quarter bridge – 3 wire
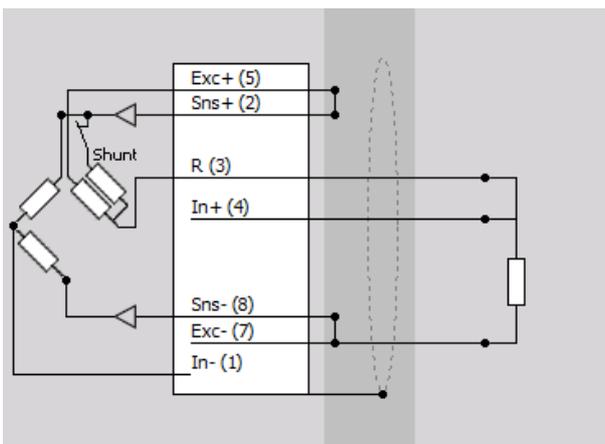
5.19.4. HD-STGS-L0B7f
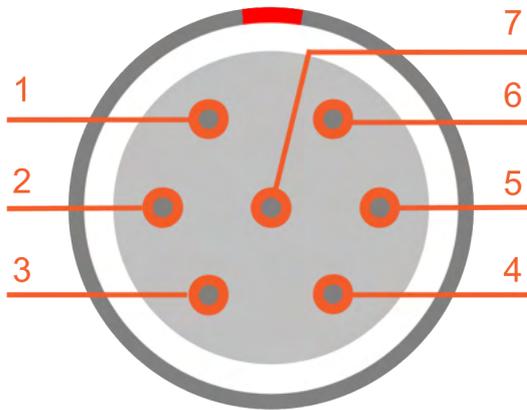
STG-L0B7f connector: pin-out (7-pin LEMO female)

Pin	Name	Description
1	Sns+	Sense +
2	Exc +	Excitation +
3	In+	Input +
4	GND	Ground
5	In-	Input -
6	Exc- / Sns-	Excitation - / Sense -
7	NC	Not connected

5.19.4.1. HD-STGS-L0B7f: Voltage

Voltage - Single ended
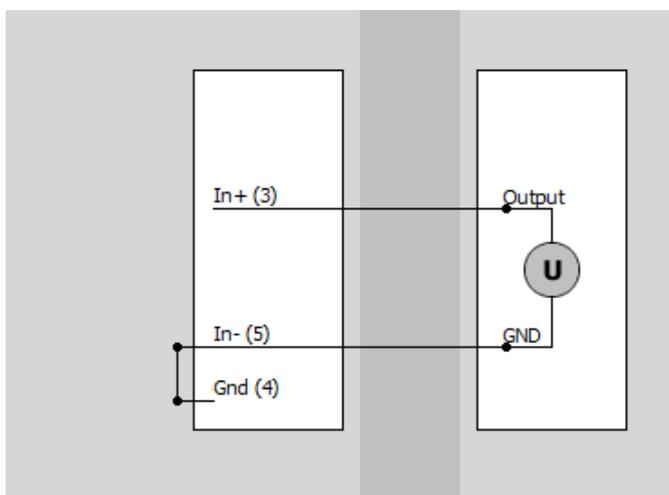
Voltage – Differential
Use only when sensor Output (+) and Output (-)
are referenced to Gnd. Gnd must be connected.
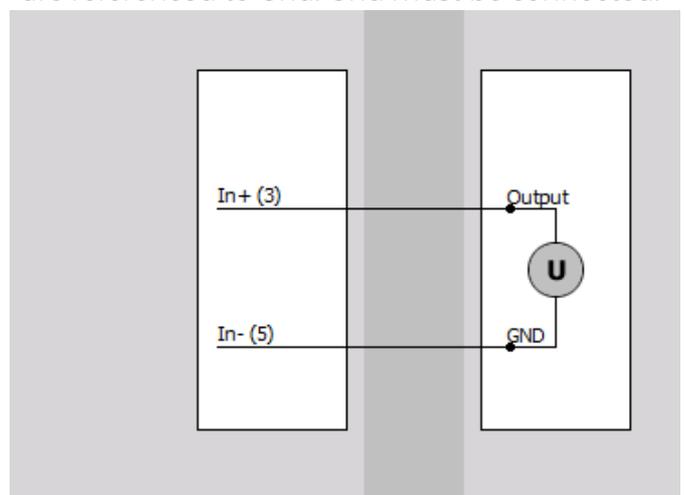
5.19.4.2. HD-STGS-L0B7f: Current

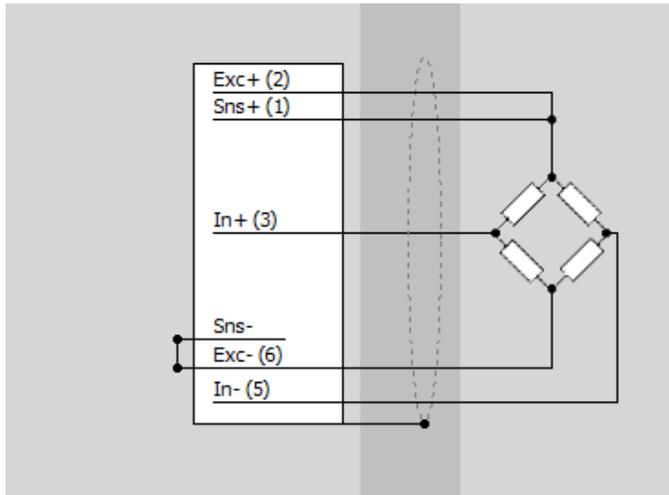**External direct shunt**
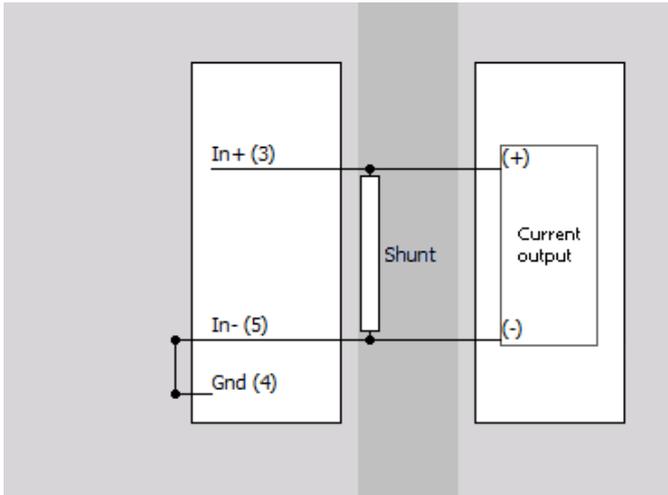
External loop powered shunt
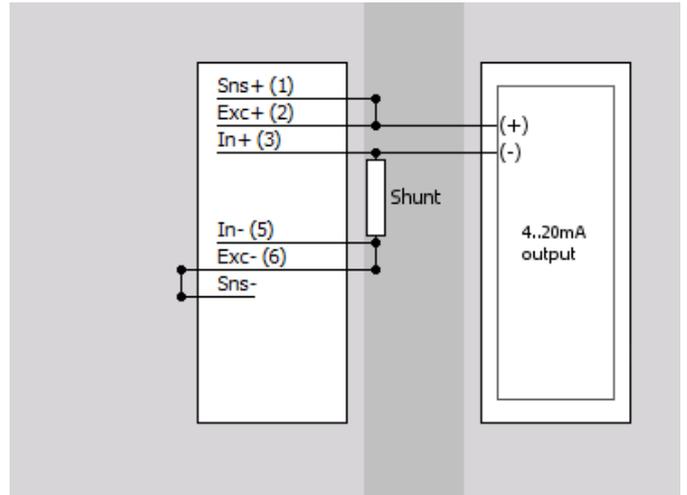
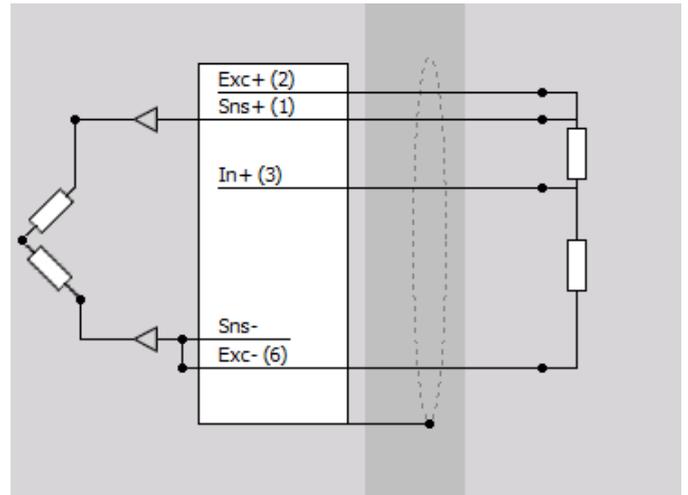## 5.19.4.3. HD-STGS-L0B7f: Potentiometer
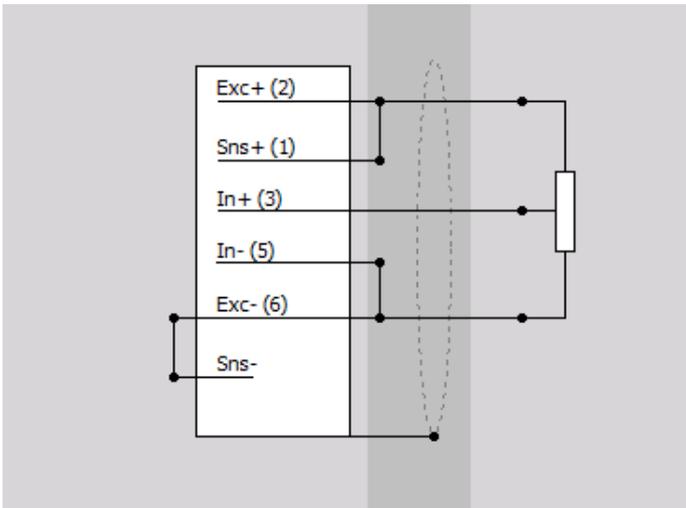
5.19.4.4. HD-STGS-L0B7f: Bridge

Full bridge

Half bridge

5.20. HS-ACC / HS-ACC+

The ACC modules are perfect for high-speed, high-sample-rate, wide-bandwidth sound and vibration IEPE channels.

5.20.1. HS-ACC: Specifications

Inputs				
Input types	Voltage IEPE			
ADC Type	16-bit SAR			
Sampling Rate	Simultaneous 1 MS/s			
Filtering	See "HS general specifications"			
Analog bandwidth	500 kHz			
Voltage ranges	**±10 Volt**	**±5 Volt**	**±1 Volt**	**±0.2 Volt**
Input Accuracy	±0.05 % of reading			
Offset Accuracy	±2 mV	±1 mV	±0.2 mV	±0.1 mV
Typ. Noise floor @ 100 kS/s	-89 dB	-89 dB	-86 dB	-83 dB
Typ. CMR @ 50 Hz / 400 Hz / 1 kHz	120 / 96 / 88 dB	126 / 100 / 92 dB	140 / 110 / 102 dB	140 / 118 / 110 dB
Gain Drift	Typical 10 ppm/K, max. 30 ppm/K			
Offset Drift	Typical 0.5 µV/K + 10 ppm of range/K, max 3 µV/K + 20 ppm of range/K			
Gain Linearity	<0.02 %			
Inter Channel Phase-mismatch	0.02° * fin [kHz] + 0.1°			
Channel Cross talk	-83 dB			
Input Coupling	DC or AC (1 Hz)			
Input Impedance	1 MΩ			
Overvoltage Protection	50 V continuous; 200 V peak (10 msec)			
IEPE mode				
Excitation	4 or 8 mA			
Compliance voltage	25 Volt			
Output Impedance	>100 kΩ			
Sensor detection	Shortcut: <4 Volt; Open: >19 Volt			
Counters (HS-ACC+ type only)				
Inputs	1 digital counter input 3 digital inputs Fully synchronised with analog data			
Counter Modes	counting, waveform timing, encoder, tacho, gear-tooth sensor			
General Counter Specifications	See "SIRIUS counter specification"			
Additional Specifications				
Input connector	BNC			
TEDS support	IEPE mode only			

5.20.2. HS-ACC

IN+

IN-

HS-ACC connector: pin-out (BNC)

SIRIUSi-HS-8xACC+
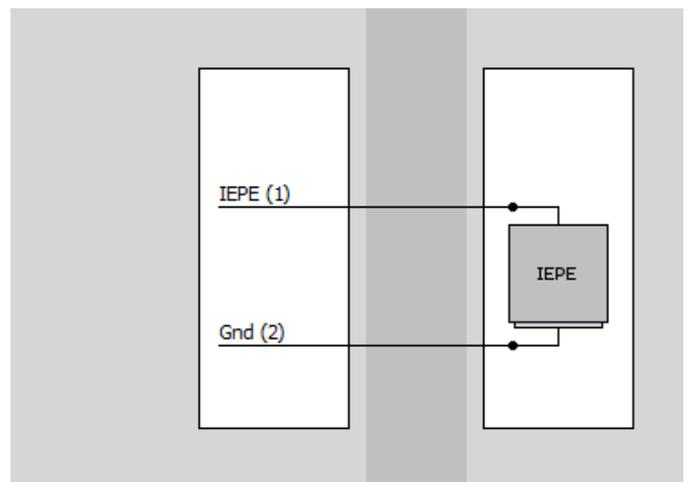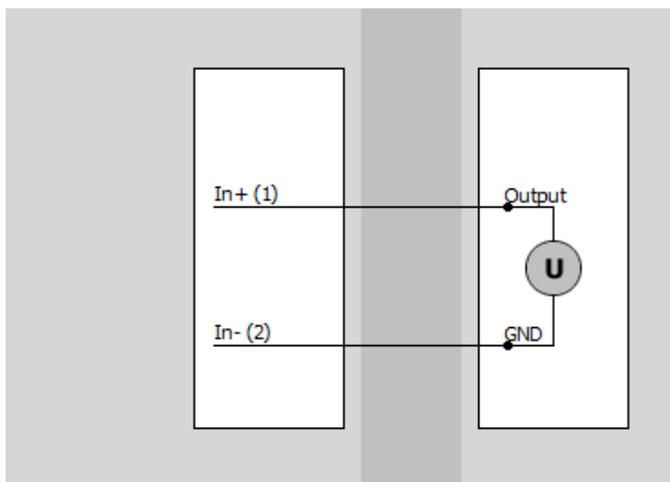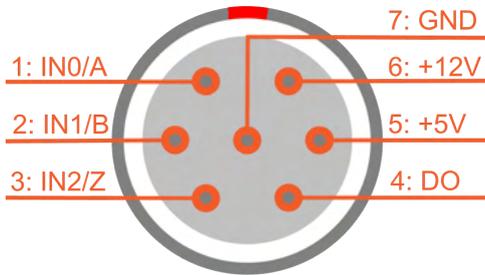
5.20.2.1. HS-ACC: Voltage, IEPE

Voltage

IEPE

5.20.3. HS-ACC+ (Counter)

The HS-ACC+ modules are perfect for high speed sound and vibration IEPE channels plus counter applications. In addition to the HS-ACC module, it also has a 7-pin Lemo connector for digital counters.

7: GND
1: IN0/A   6: +12V
2: IN1/B   5: +5V
3: IN2/Z   4: DO

CNT connector: pin-out (7-pin LEMO female)

SIRIUSi-HS-8xACC+

Connector type L1B7f

Connector on the module: EGG.1B.307.CLL
Mating cable connector: FGG.1B.307.CLAD52

Caution
GND of the counter input is connected via a 50 Ω resistor to In- of the analog channel.

Digital output configuration
The "switch" of the open collector output is closed when active.

< 30 V
DO R DO
GND

< 30 V
DO LAMP RELAY
GND
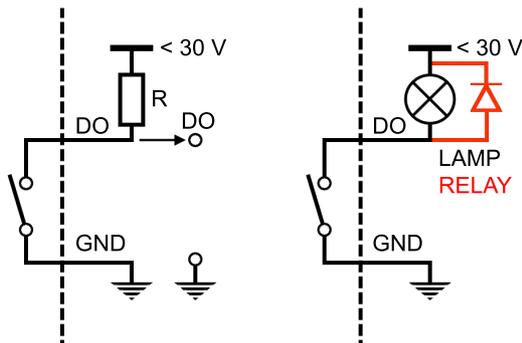
5.21. HS-CHG / HS-CHG+

The CHG modules are perfect for high-speed, high-sample-rate, wide-bandwidth charge measurements and also sound and vibration IEPE channels.

5.21.1. HS-CHG: Specifications

Inputs				
Input types	Voltage IEPE Charge			
ADC Type	16-bit SAR			
Sampling Rate	Simultaneous 1 MS/s			
Filtering	See "HS general specifications"			
Analog bandwidth (see 1)	500 kHz			
Voltage ranges	**±10, ±5, ±2, ±1, ±0.5, ±0.2, ±0.1 Volt**			
Input Accuracy	Signal frequency	Accuracy		
	DC	±0.05 % of reading ±0.02 % of range ±50 µV		
	up to 10kHz	±0.1 % of reading ±0.05 % of range		
	up to 100kHz	±2 % of reading ±0.1 % of range		
Typ. Noise floor	Sample rate/Range →	10 V	5 V	1 V	0.1 V
	1 MS/s	-88 dB	-87 dB	-85 dB	-68 dB
	200 kS/s	-89 dB	-89 dB	-88 dB	-83 dB
	20 kS/s	<-100 dB	<-100 dB	<-100 dB	-92 dB
Typical CMR	50 Hz / 1 kHz	>140 / 120 dB	>140 / 124 dB	>140 / 126 dB	>140 / 126 dB
Gain Drift	Typical 10 ppm/K, max. 30 ppm/K			
Offset Drift	Typical 0.5 µV/K + 10 ppm of range/K, max 3 µV/K + 20 ppm of range/K			
Gain Linearity	<0.02 %			
Inter Channel Phase-mismatch	0.02° * fin [kHz] + 0.1°			
Channel Cross talk	-110 dB @ 1 kHz; -90 dB @ 10 kHz			
Input Coupling	DC or AC (0.1 Hz, 1 Hz, 10 Hz or 100 Hz)			
Input Impedance	1 MΩ / 100 pF			
Overvoltage Protection	50 V continuous; 200 V peak (10 msec)			
IEPE mode				
Excitation	4 or 8 mA			
Compliance voltage	25 Volt			
Output Impedance	>100 kΩ			
Sensor detection	Shortcut: <4 Volt; Open: >19 Volt			
Charge ranges	**±100 000, 50 000, 20 000, 10 000, 5000, 2000, 1000 pC**			
Input Accuracy	±0.5 % of reading ±0.05 % of range ±2 pC			
Input Coupling	0.01 Hz, 0.03 Hz, 0.1 Hz, 0.5 Hz, 1 Hz, 10 Hz or 100 Hz			

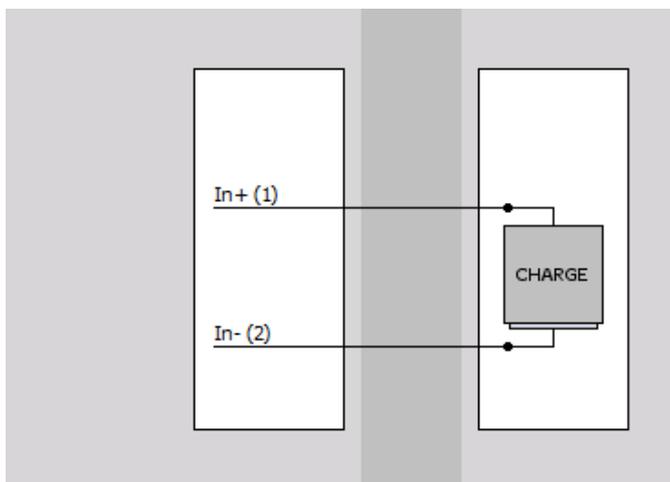| Counters (only on HS-CHG+ type)	
Inputs	1 digital counter input 3 digital inputs Fully synchronised with analog data
Counter Modes	counting, waveform timing, encoder, tacho, gear-tooth sensor
General Counter Specifications	See "SIRIUS counter specification"
Additional Specifications	
Input connector	BNC (others on request)
TEDS support	IEPE mode only
1) 200 kHz for Charge ranges	

5.21.2. HS-CHG

CHG connector: pin-out (BNC)

SIRIUSi-HS-8xCHG

5.21.2.1. HS-CHG: Voltage, IEPE, Charge

Voltage

IEPE
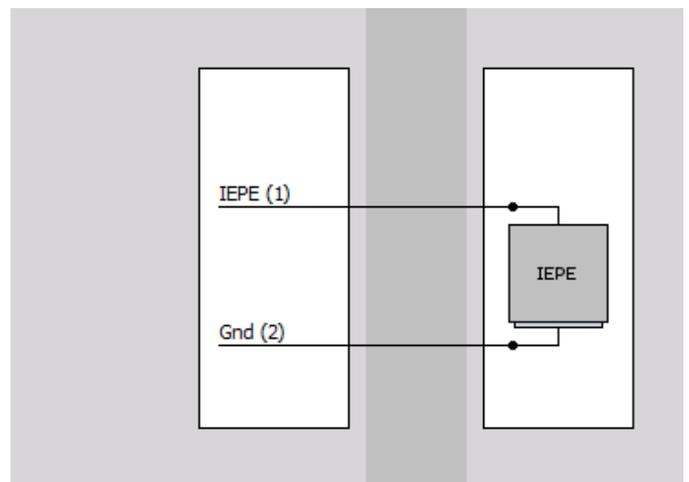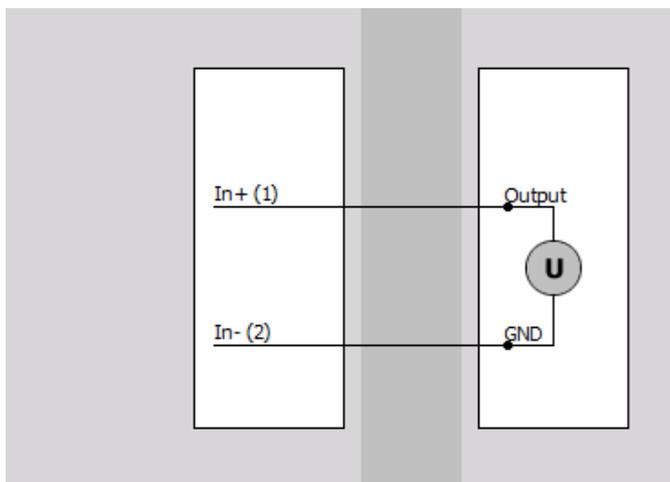
Charge

5.21.3. HS-CHG+ (Counter)
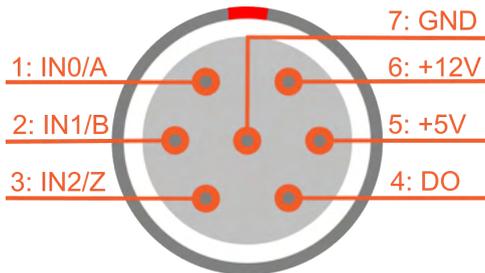
7: GND
1: IN0/A
6: +12V
2: IN1/B
5: +5V
3: IN2/Z
4: DO

CNT connector: pin-out (7-pin LEMO female)

SIRIUSi-HS-8xCHG+

Connector type L1B7f
Connector on the module: EGG.1B.307.CLL
Mating cable connector: FGG.1B.307.CLAD52

Caution
GND of the counter input is connected via a 50 Ω resistor to In- of the analog channel.

Digital output configuration

< 30 V
R
DO
DO
GND

< 30 V
DO
LAMP
RELAY
GND
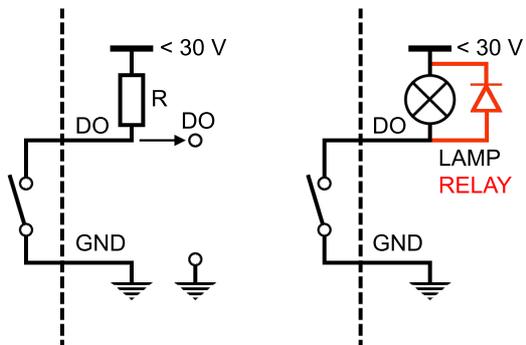
5.22. HS-HV

The HV modules are perfect for high-speed, high-sample-rate, wide-bandwidth high voltage measurements.

5.22.1. HS-HVv2: Specifications

Inputs				
Input types	Voltage			
ADC Type	16-bit SAR			
Sampling Rate	Simultaneous 1 MS/s			
Filtering	See "HS general specifications"			
Analog bandwidth	2 MHz			
Voltage ranges	**±1600 V, ±800 V, ±400 V, ±200 V, ±100 V, ±50 V, ±20 V**			
Input Accuracy (see 1)	Signal frequency	Accuracy		
	DC	±0.03 % of reading ±0.02 % of range ±0.04 V		
	Up to 1 kHz	±0.03 % of reading ±0.02 % of range		
	Up to 10 kHz	±0.1 % of reading ±0.05 % of range		
	Up to 100 kHz	±2 % of reading ±0.1 % of range		
	Up to 1000 kHz	±5 % of reading ±0.5 % of range		
Typ. Noise floor	Sample rate/Range →	1600 V	400 V	100 V
	1 MS/s	-83 dB	-79 dB	-71 dB
	200 kS/s	-85 dB	-85 dB	-82 dB
	20 kS/s	-100 dB	-97 dB	-90 dB
Typ. CMR @ 50 Hz / 1 kHz / 10 kHz	85 dB / 75 dB / 50 dB			
Gain Drift	Typical 25 ppm/K, max. 50 ppm/K			
Offset Drift	Typical 1 mV/K + 10 ppm of range/K, max 2 mV/K + 15 ppm of range/K			
Gain Linearity	<0.02 %			
Channel Cross talk	-115 dB @ 50 Hz; -90 dB @ 1 kHz			
Input Coupling	DC			
Input Impedance	10 MΩ || 2 pF			
Overvoltage category	CAT II 1000 V			
Maximum input voltage	2000 V DC or ACrms			
Additional Specifications				
Input connector	Banana			
TEDS support	NA			
1) 50 V Range (1.2 MHz) and 20 V range (700 kHz) have limited bandwidth				

5.22.2. HS-HVv3: Specifications

Inputs			
Input types	Voltage		
ADC Type	16-bit SAR		
Sampling Rate	Simultaneous 1 MS/s		
Filtering	See "HS general specifications"		
Analog bandwidth	2 MHz (1.5 MHz for 50 V range, 800 kHz for 20 V range)		
Voltage ranges	±2000 V, ±1000 V, ±400 V, ±200 V, ±100 V, ±50 V, ±20 V		
Input Accuracy	Signal frequency	Accuracy	
	DC	±0.03 % of reading ±0.02 % of range ±0.04 V	
	Up to 1 kHz	±0.03 % of reading ±0.02 % of range	
	Up to 10 kHz	±0.1 % of reading ±0.05 % of range	
	Up to 100 kHz	±2 % of reading ±0.1 % of range	
	Up to 1000 kHz	±5 % of reading ±0.5 % of range	
Typ. Noise floor	Sample rate/Range →	2000 V	400 V	100 V
	1 MS/s	-84 dB	-80 dB	-71 dB
	200 kS/s	-86 dB	-85 dB	-83 dB
	20 kS/s	-100 dB	-96 dB	-91 dB
Typ. CMR @ 50 Hz / 1 kHz / 10 kHz	95 dB / 75 dB / 55 dB		
Gain Drift	Typical 25 ppm/K, max. 50 ppm/K		
Offset Drift	Typical 1 mV/K + 10 ppm of range/K, max 2 mV/K + 15 ppm of range/K		
Gain Linearity	<0.02 %		
Channel Cross talk	-115 dB @ 50 Hz; -90 dB @ 1 kHz		
Input Coupling	DC		
Input Impedance	10 MΩ || 2 pF		
Overvoltage category	CAT II 1000 V		
Maximum input voltage	2000 V DC or ACrms		
Additional Specifications			
Input connector	Banana		
TEDS support	NA		
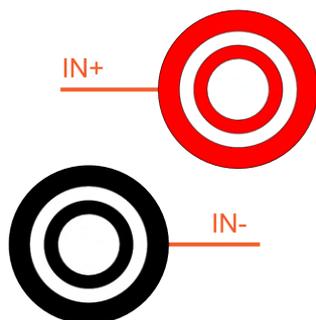
5.22.3. HS-HV

HS-HV connector: pin-out (Banana plug)

SIRIUSi-HS-8xHV

5.22.3.1. HS-HV: Voltage
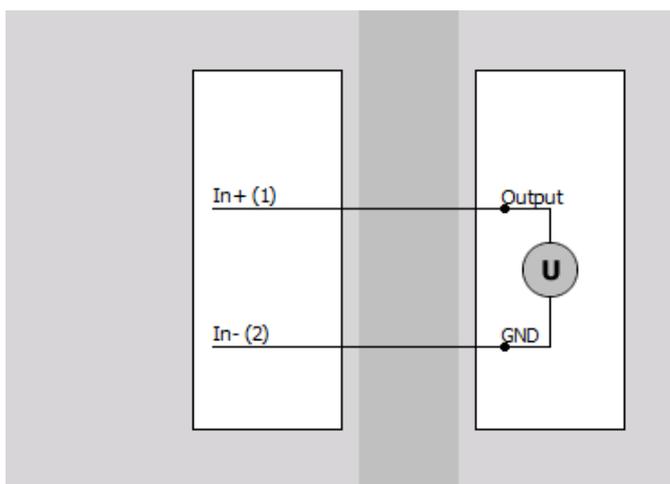
5.23. HS-LV / HS-LV+

The HS-LV modules are perfect for high-speed, high-sample-rate, wide-bandwidth low voltage and current measurements in combination with current clamps.

5.23.1. HS-LVv2 Specifications

Inputs			
Input types	Voltage Full bridge strain Current (ext. Shunt)		
ADC Type	16-bit SAR		
Sampling Rate	Simultaneous 1 MS/s		
Filtering	See "HS general specifications"		
Analog bandwidth	1 MHz (800 kHz for ranges ≤0.2 V)		
Voltage ranges	**±100, 50, 20, 10, 5, 2, 1, 0.5, 0.2, 0.1 and 0.05 Volt**		
Input Accuracy	Signal frequency	Accuracy	
	DC	±0.03 % of reading ±0.02 % of range ±100 µV (2 mV for Ranges ≥10 Volt)	
	Up to 1 kHz	±0.03 % of reading ±0.02 % of range	
	Up to 10 kHz	±0.1 % of reading ±0.05 % of range	
	Up to 100 kHz	±2 % of reading ±0.1 % of range	
	Up to 1000 kHz	±5 % of reading ±0.5 % of range	
Offset accuracy after Balance Amplifier	Range <10 V: ±0.002 % of range ±3 µV; Range ≥10 V: ±0.005 % of range		
Typ. Noise floor	Sample rate/Range →	100 V	5 V	0.5 V
	1 MS/s	-85 dB	-86 dB	-78 dB
	200 kS/s	-88 dB	-88 dB	-87 dB
	20 kS/s	<-100 dB	<-100 dB	-95 dB
Typical CMR	Bandwidth/Range →	100 V	5 V	0.5 V
	50 Hz	70 dB	88 dB	102 dB
	400 Hz	70 dB	86 dB	100 dB
	10 kHz	55 dB	70 dB	80 dB
Gain Drift	Typical 10 ppm/K, max. 30 ppm/K		
Offset Drift	Typical 0.3 µV/K + 5 ppm of range/K, max 2 µV/K + 10 ppm of range/K		
Gain Linearity	<0.02 %		
Inter channel phase mismatch	0.02° * fin [kHz] + 0.1° (5 V Range)		
Channel Cross talk Range	<10 V: -120 dB @ 10 kHz; Range ≥10 V: -95 dB @ 10 kHz		
Input Coupling (see 1)	DC, AC 1 Hz (3 Hz, 10 Hz per SW)		
Input Impedance	Range <10 V: 10 MΩ; Range ≥10 V: 1 MΩ || 110 pF between INx to GND		
Max. Common Mode Voltage	Isolated version: ±500 V		
	Differential version: Ranges ≥10 Volt: ±100 V; all other Ranges: ±12 V		
Overvoltage Protection	<10 V: 100 V (200 V peak for 10 msec); Range ≥10 V: 300 V cont.		

Excitation Voltage	
Excitation Voltage	Unipolar or Bipolar Software selectable Free programmable (16-bit DAC)
Excitation Level	unipolar 0...24 Volt; Predefined levels: 1, 2.5, 5, 10, 12, 15, 20 and 24 VDC
Excitation Level	bipolar 2...30 Volt; Predefined levels: 2.5, 5, 10, 12, 15, 24 and 30 VDC
Accuracy	±0.1 % ±5 mV
Drift	±50 ppm/K ±100 µV/K
Stability 10 % to 90 % load (bipolar)	<0.01 %
Current limit	200 mA (2 Watt max. per Channel, 12 Watt max. per Slice)
Protection	Continuous short to ground
Input short, Sensor offset adjust	Software selectable
Counters (only on HS-LV+ type)	
Inputs	1 digital counter input 3 digital inputs Fully synchronised with analog data
Counter modes	counting, waveform timing, encoder, tacho, gear tooth sensor
General Counter Specifications	See "SIRIUS counter specification"
Additional Specifications	
Input connector	DSUB-9, Banana, BNC (others on request)
TEDS support	Standard + DSI® adapters
1) In- must be within ±10 V referred to GND (iso); for Ranges ≥10 V the DC value of In- is not rejected	

5.23.2. HS-LV

1: Exc+
2: In+
3: Sns-
4: GND
5: DI status
6: Sns+
7: In-
8: Exc-
9: TEDS
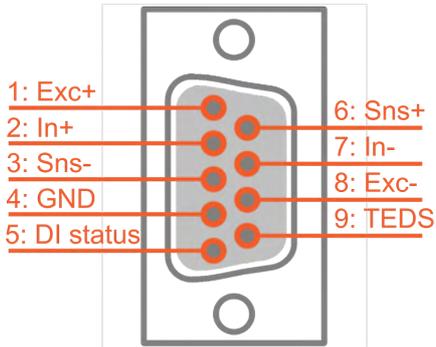
HS-LV connector: pin-out (DSUB-9 female)

SIRIUSi-HS-8xLV

Important

Digital status input

Pin 5: DI Status is used for digital status input: i.e. show alarm status in DewesoftX® when a current clamp is open. See "Accessories and Sensors Technical Reference Manual"!

5.23.2.1. HS-LV: Voltage

Voltage - Single ended
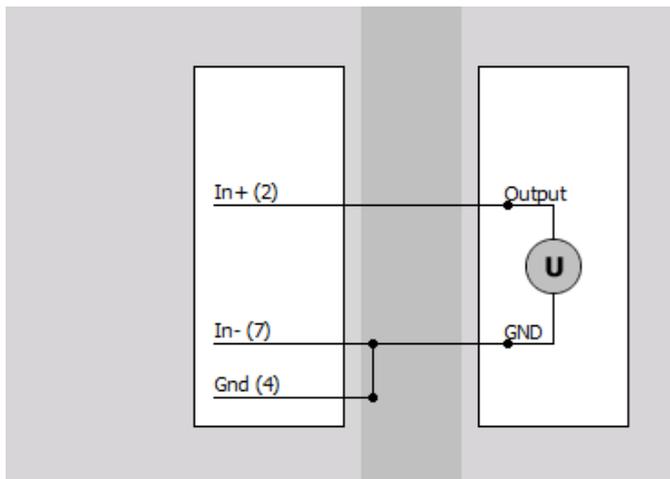
Voltage – Differential
Use only when sensor Output (+) and Output (-) are referenced to Gnd. Gnd must be connected.
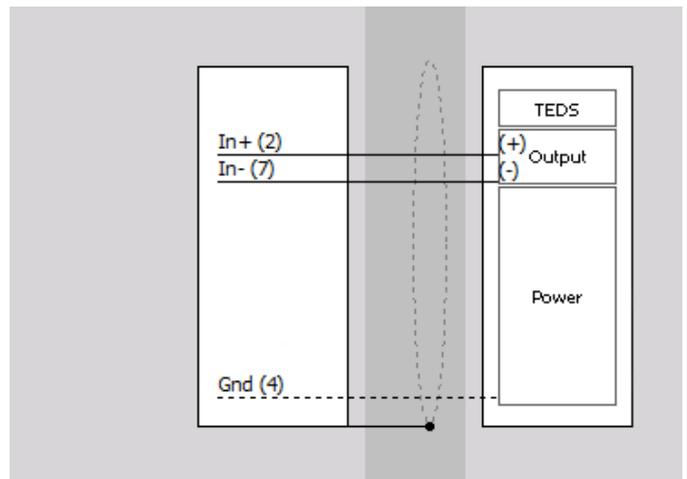
5.23.2.2. HS-LV: Current

External direct shunt
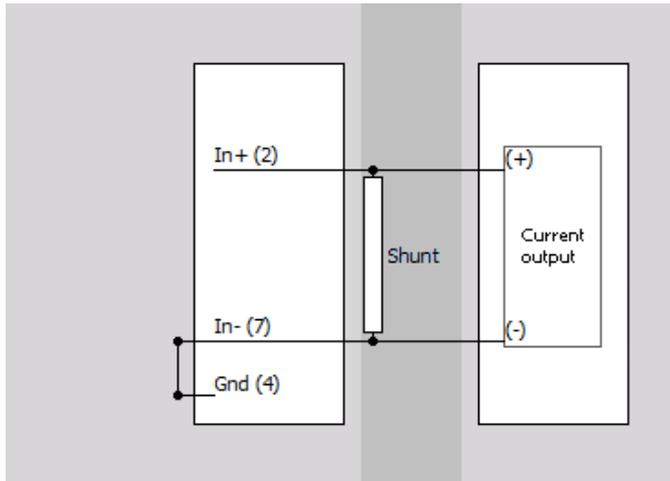
External loop powered shunt
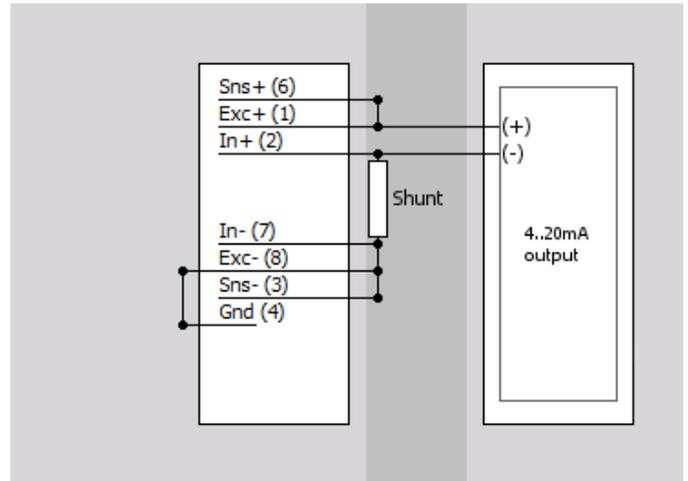
5.23.2.3. HS-LV: Bridge

Full Bridge

5.23.3. HS-LV-BAN

IN+

IN-

HS-LV-BAN connector: pin-out (Banana plug)
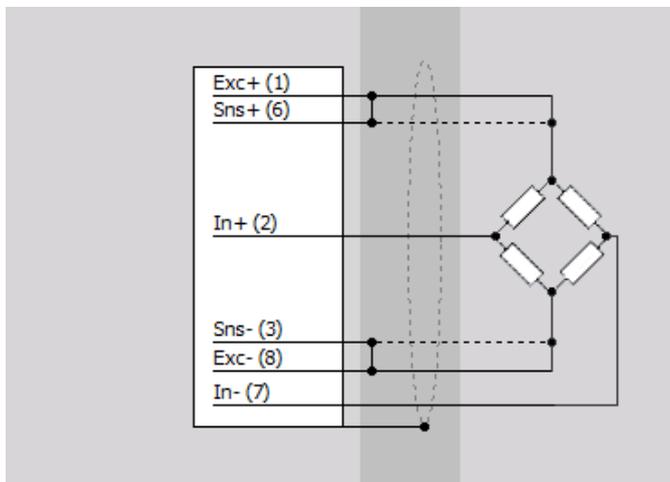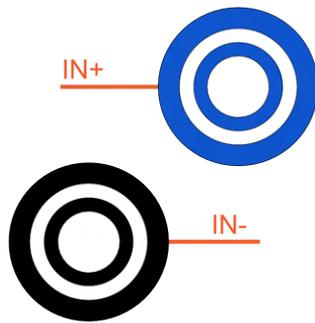
SIRIUSi-HS-8xLV-BAN

5.23.3.1. HS-LV-BAN: Voltage, Current
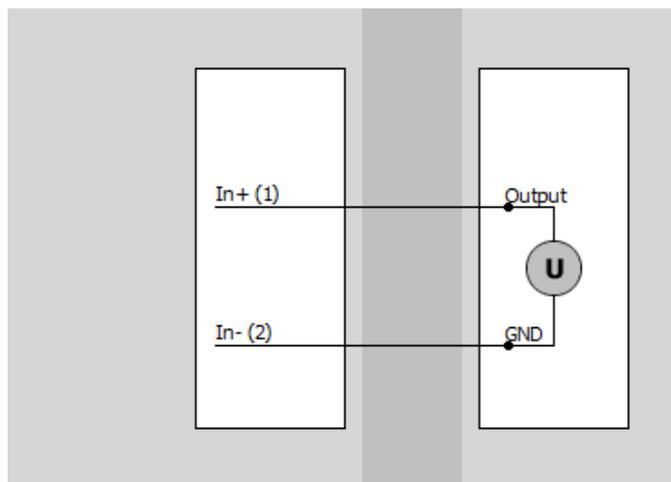
Voltage

Current

5.23.4. HS-LV-BNC

IN+

IN-
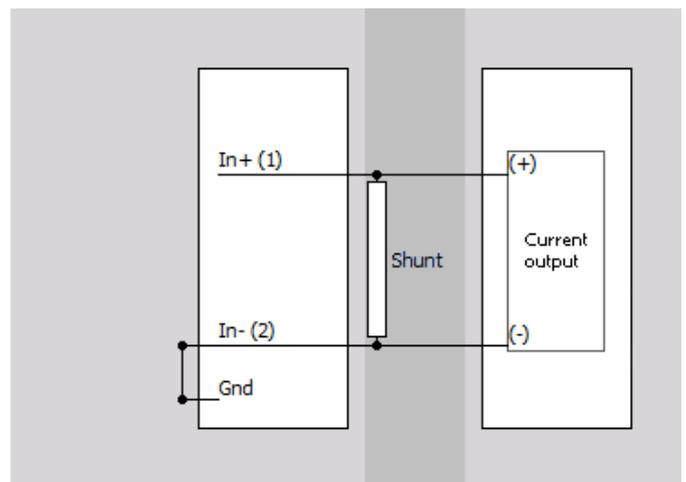
HS-LV-BNC connector: pin-out (BNC)

SIRIUSi-HS-8xLV-BNC

5.23.4.1. HS-LV-BNC: Voltage, Current

Voltage
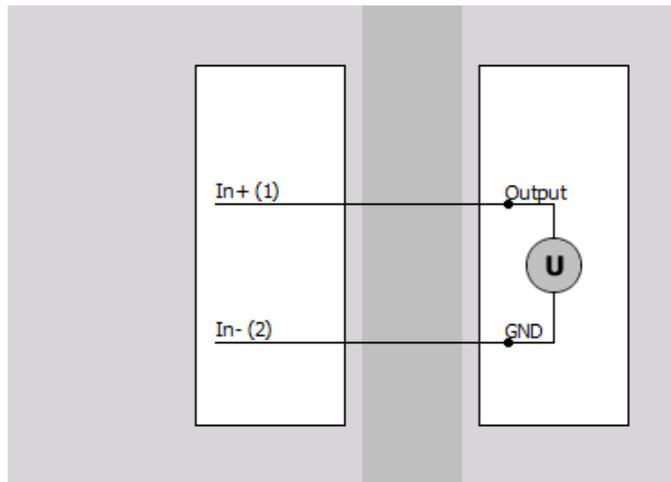
Current
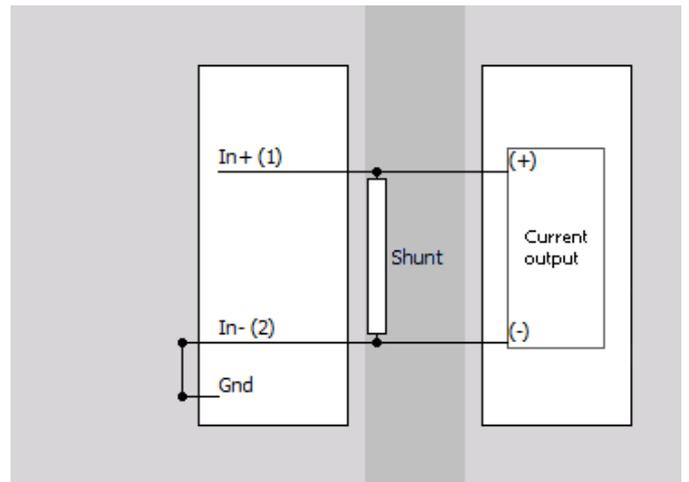
5.23.5. HS-LV+ (Counter)

As an additional function to the HS-LV module, the HS-LV+ module also has a 7-pin Lemo connector for digital counters.

1: IN0/A
2: IN1/B
3: IN2/Z
4: DO
5: +5V
6: +12V
7: GND

CNT connector: pin-out (7-pin LEMO female)

SIRIUSi-HS-8xLV+

Connector type L1B7f
Connector on the module: EGG.1B.307.CLL
Mating cable connector: FGG.1B.307.CLAD52

Caution
GND of the counter input is connected to the GND of the analog channel.

Digital output configuration
The "switch" of the open collector output is closed when active.
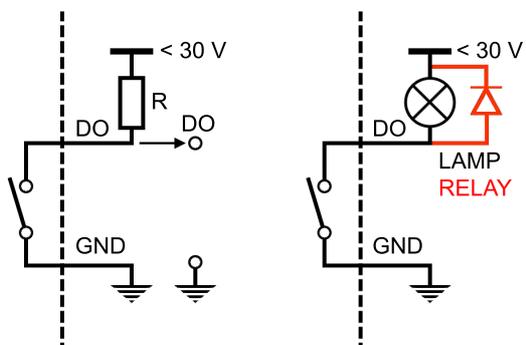
5.24. HS-STG / HS-STG+

The STG module is THE universal amplifier perfectly fitting for high-speed, high-sample-rate, wide-bandwidth strain gauge and mid-level voltage measurements with powerful sensor constant voltage and current excitation.

Hint
Internally, potentiometer mode is actually a half-bridge connection. Pin IN- is connected to the half-bridge point.

5.24.1. HS-STG Specifications

Inputs			
Input types	Voltage Full/Half/Quarter bridge strain (120 Ω and 350 Ω) Potentiometer, RTD, Resistance Current (ext. Shunt)		
ADC Type	16-bit SAR		
Sampling Rate	Simultaneous 1 MS/s		
Filtering	See "HS general specifications"		
Analog bandwidth	1 MHz (800 kHz for ranges ≤0.2 V)		
Voltage ranges	**±50, 20, 10, 5, 2, 1, 0.4, 0.2, 0.1, 0.04 and 0.02 Volt**		
Input Accuracy	Signal frequency	Accuracy	
	DC	Range <10 V: ±0.03 % of reading ±0.04 % of range ±10 µV	
		Range ≥10 V: ±0.05 % of reading ±0.01 % of range ±5 mV	
	Up to 1 kHz	±0.03 % of reading ±0.02 % of range	
	Up to 10 kHz	±0.1 % of reading ±0.05 % of range	
	Up to 100 kHz	±2 % of reading ±0.1 % of range	
	Up to 500 kHz	±10 % of reading ±0.5 % of range	
Offset accuracy after Balance Amplifier	Range <10 V: ±0.002 % of range ±3 µV; Range ≥10 V: Not performed		
Typ. Noise floor	Sample rate/Range →	50 V	5 V	0.2 V
	1 MS/s	-87 dB	-88 dB	-81 dB
	200 kS/s	-88 dB	-88 dB	-85 dB
	20 kS/s	<-100 dB	<-100 dB	-94 dB
Typical CMR	Bandwidth/Range →	50 V	5 V	0.2 V
	50 Hz	70 dB	88 dB	102 dB
	400 Hz	70 dB	86 dB	100 dB
	10 kHz	55 dB	70 dB	80 dB
Gain Drift	Typical 10 ppm/K, max. 30 ppm/K		
Offset Drift	typical 0.3 µV/K + 15 ppm of range/K, max 2 µV/K + 40 ppm of range/K		
Gain Linearity	<0.02 %		
Inter channel phase mismatch	0.02° * fin [kHz] + 0.1° (5 V Range)		
Channel Cross talk	Range <10 V: -120 dB @ 10 kHz; Range ≥10 V: -95 dB @ 10 kHz		
Input Coupling (see 1)	DC, AC 1 Hz (3 Hz, 10 Hz per SW)		

Input Impedance	Range <10 V: 10 MΩ; Range ≥10 V: 1 MΩ between INx to GND
Max. common mode voltage	Isolated version: ±500 V
	Differential version: Ranges ≥10 Volt: ±60 V; all other Ranges: ±12 V
Overvoltage Protection	Range <10 V: 100 V (200 V peak for 10 msec); Range ≥10 V: 300 V cont.
Excitation Voltage	
Excitation Voltage	Free programmable (16-bit DAC)
Predefined levels	0, 1, 2.5, 5, 10, 15 and 20 VDC
Accuracy	±0.05 % ±2 mV
Drift	±10 ppm/K ±100 µV/K
Load stability 0 % to 100 % load	<0.01 %
Line regulation over 20 Ω of change	<0.005 % @ 120 Ω load
Noise @ 10 Volt / 350 Ω	< 200 µVrms @ 10 kHz BW
Sense Impedance to Exc / to GND	100 kΩ / 100 MΩ
Current limit	100 mA (max. 800 mW)
Protection	Continuous short to ground
Input short, Sensor offset adjust	Software selectable
Excitation Current	
Excitation Current	Free programmable (16-bit DAC)
Predefined levels	0.1, 1, 2, 5, 10, 20 and 60 mADC
Accuracy (>10 mA)	0.1 % ±2 µA [0.5 % ±50 µA]
Drift (>10 mA)	15 ppm/K [100 ppm/K]
Compliance voltage	20 Volt, max. 300 mW
Output Impedance	>1 MΩ
Bridge Connection Types	
Bridge types	Full / Half / Quarter bridge (3-wire or 4-wire)
Ranges	2 mV/V...1000 mV/V free programmable
Internal Bridge Completion	½ bridge and ¼ bridge 120 Ω and 350 Ω
Bridge Completion Accuracy	0.05 %; TCR: 5 ppm/K (others on request)
Internal Shunt Resistor	59.88 kΩ and 175 kΩ, bipolar (to +Exc and -Exc)
Maximum sensor resistance	5 kΩ for Full and Half bridge measurements
Typ. Shunt Resistor Accuracy	0.05 %; TCR: 10 ppm/K (others on request)
Sensor Balance Range	220 % of Range (70 % for input Range ≥5 Volt)
Input Short, Sensor Offset Adjust	Software selectable
Counters (only on HS STG+)	
Inputs	1 digital counter input 3 digital inputs Fully synchronised with analog data
Counter modes	counting, waveform timing, encoder, tacho, gear-tooth sensor

General Counter Specifications	See "SIRIUS counter specification"
Additional Specifications	
Input connector	DSUB-9 (others on request)
TEDS support	Standard + DSI® adapters
1) In- must be within ±10 V referred to GND (iso); for Ranges ≥10 V the DC value of In- is not rejected	

5.24.2. HS-STG

1: Exc+
2: In+
3: Sns-
4: GND
5: R+

6: Sns+
7: In-
8: Exc-
9: TEDS
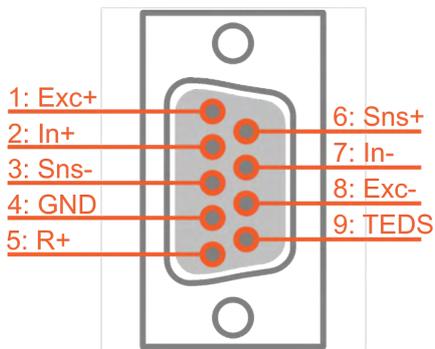
HS-STG connector: pin-out (DSUB-9 female)

SIRIUSi-HS-8xSTG

5.24.2.1. HS-STG: Voltage

Voltage - Single ended
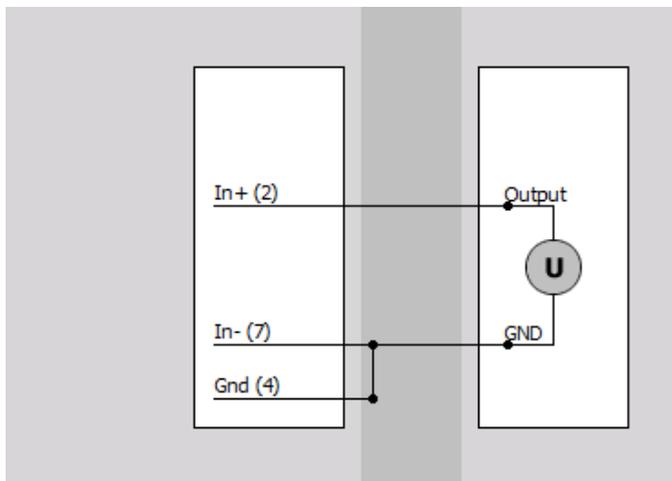
In+ (2) ——— Output
U
In- (7) ——— GND
Gnd (4)

Voltage – Differential
Use only when sensor Output (+) and Output (-) are referenced to Gnd. Gnd must be connected.

TEDS
In+ (2) ——— (+) Output
In- (7) ——— (-)
Power
Gnd (4)
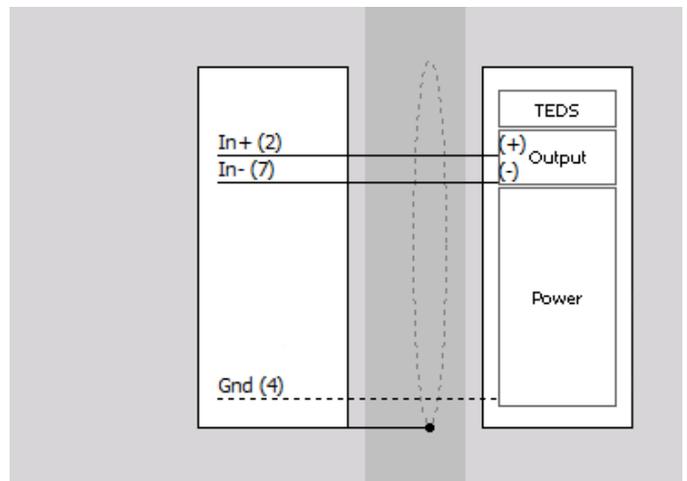
5.24.2.2. HS-STG: Current

External direct shunt
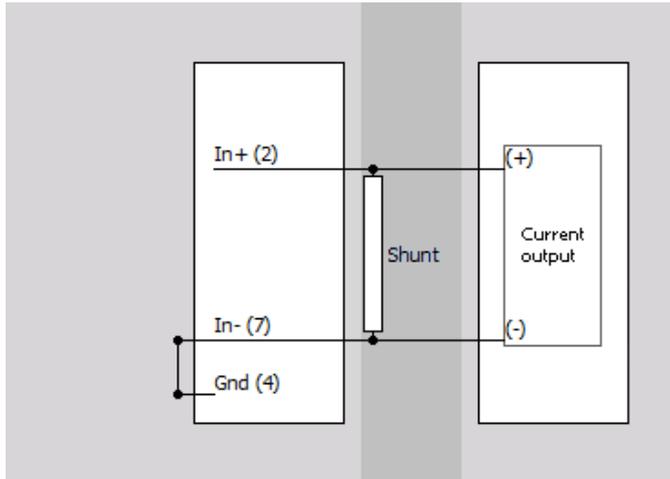
External loop powered shunt
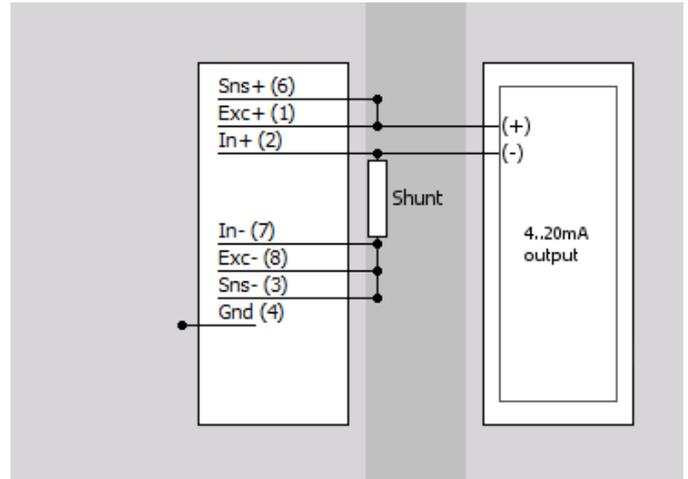
5.24.2.3. HS-STG: Temperature
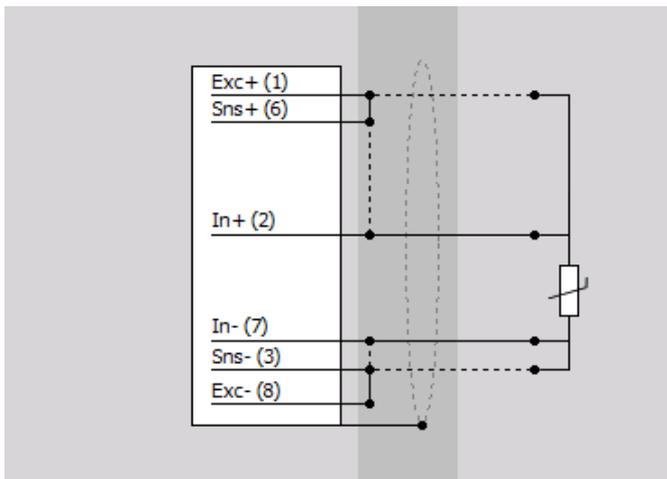
5.24.2.4. HS-STG: Resistance
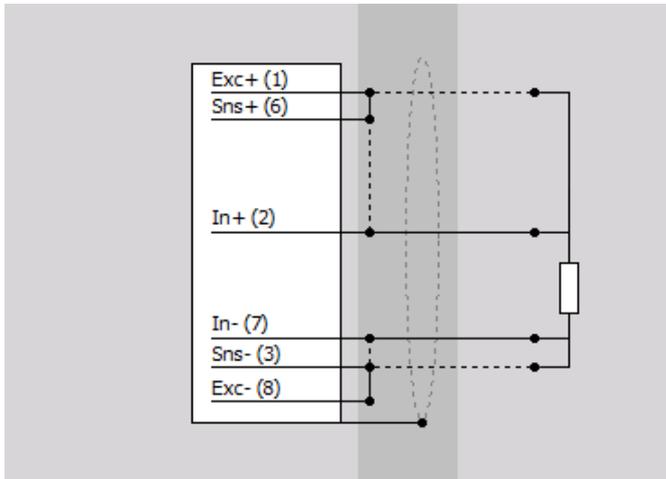
5.24.2.5. HS-STG: Potentiometer
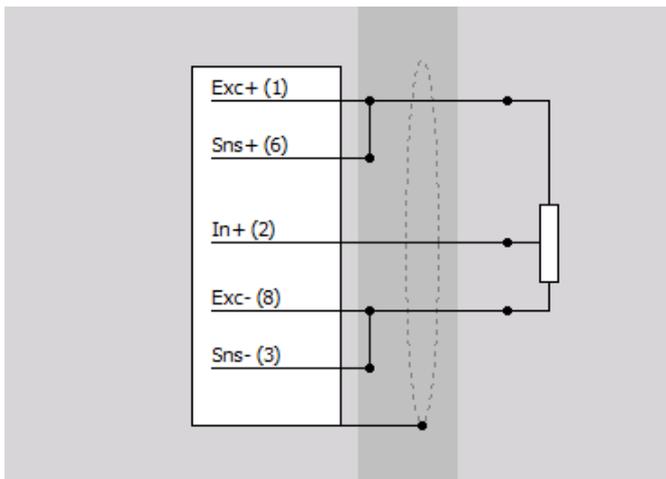
5.24.2.6. HS-STG: Bridge

Full bridge
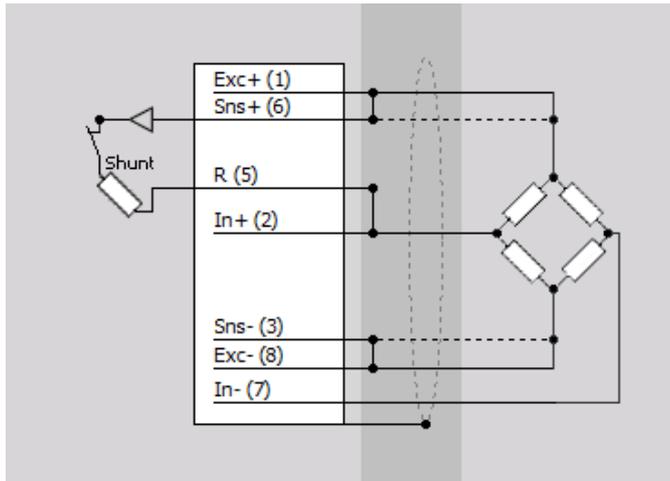
Half bridge
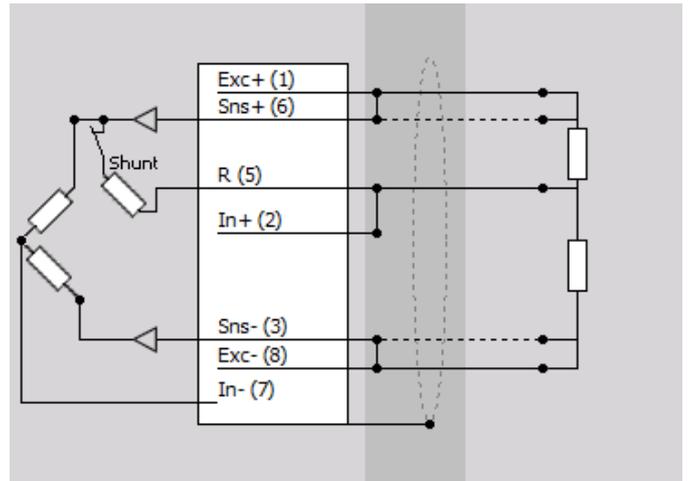
Quarter bridge – 3 wire
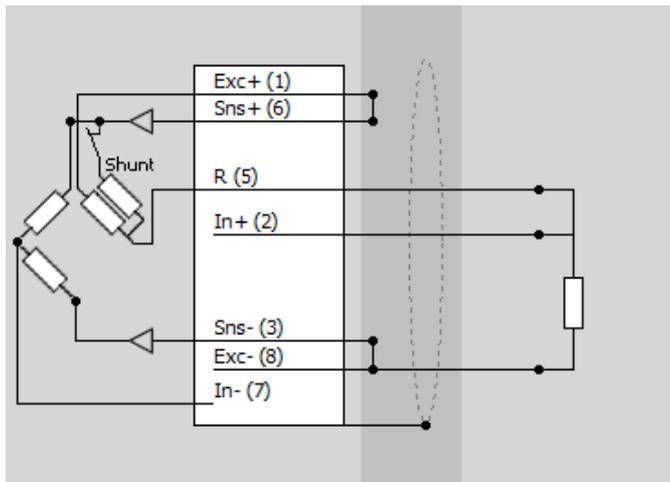
Quarter Bridge – 4 wire
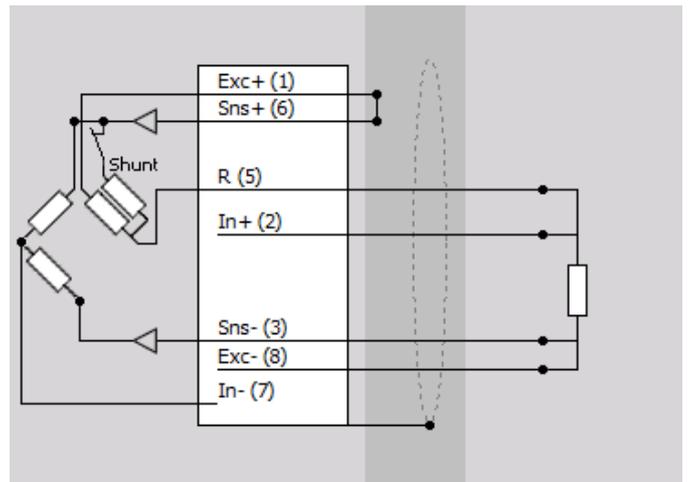
5.24.2.6.1. HS-STG: Bridge Accurac

Bridge range	Set excitation	Accuracy
2 mV/V	1 V	0.063 % of reading + 18 uV/V
20 mV/V	1 V	0.19 % of reading + 18 uV/V
200 mV/V	1 V	0.22 % of reading + 90 uV/V
1000 mV/V	1 V	0.22 % of reading + 410 uV/V
2 mV/V	2.5 V	0.052 % of reading + 7.2 uV/V
20 mV/V	2.5 V	0.084 % of reading + 20 uV/V
200 mV/V	2.5 V	0.09 % of reading + 170 uV/V
1000 mV/V	2.5 V	0.091 % of reading + 810 uV/V
2 mV/V	5 V	0.049 % of reading + 3.6 uV/V
20 mV/V	5 V	0.071 % of reading + 10 uV/V
200 mV/V	5 V	0.074 % of reading + 82 uV/V
1000 mV/V	5 V	0.074 % of reading + 410 uV/V
2 mV/V	10 V	0.049 % of reading + 1.8 uV/V
20 mV/V	10 V	0.058 % of reading + 9.0 uV/V
200 mV/V	10 V	0.059 % of reading + 81 uV/V
1000 mV/V	10 V	0.066 % of reading + 210 uV/V
2 mV/V	15 V	0.047 % of reading + 1.8 uV/V
20 mV/V	15 V	0.051 % of reading + 12 uV/V
200 mV/V	15 V	0.049 % of reading + 140 uV/V
1000 mV/V	15 V	0.064 % of reading + 140 uV/V
2 mV/V	20 V	0.048 % of reading + 1.3 uV/V
20 mV/V	20 V	0.052 % of reading + 8.5 uV/V
200 mV/V	20 V	0.05 % of reading + 110 uV/V
1000 mV/V	20 V	0.063 % of reading + 110 uV/V

5.24.3. HS-STG: Sensor connection

To minimize electromagnetic influence, it is recommended to use twisted pair cables. The shield of the cable should be connected to GNDiso on pin 4 of the DSUB-9 connector.
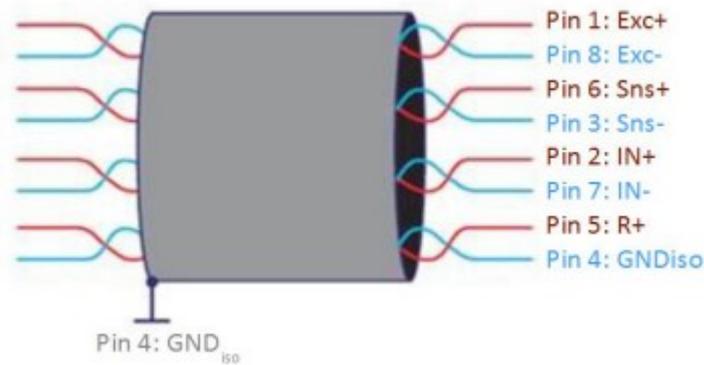
HS-STG Sensor connection
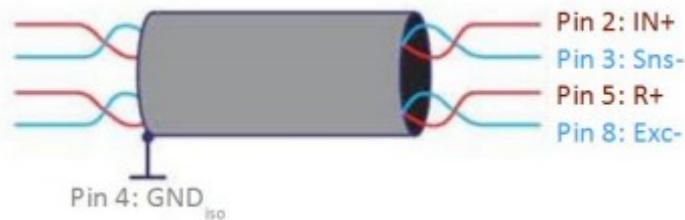
HS-STG Sensor ¼ Bridge connection

Hint

When your application requires a bandwidth ≥ 100 kHz, it is recommended to use external bridge completion. This fully symmetrical system configuration will guarantee the best possible noise reduction.

5.24.4. HS-STG+ (Counter)

7: GND
6: +12V
5: +5V
4: DO
1: IN0/A
2: IN1/B
3: IN2/Z

CNT connector: pin-out (7-pin LEMO female)

SIRIUSi-HS-STG+

Connector type L1B7f

Connector on the module: EGG.1B.307.CLL
Mating cable connector: FGG.1B.307.CLAD52

☼ Caution
GND of the counter input is connected to the GND of the analog channel.

Digital output configuration
The "switch" of the open collector output is closed when active.
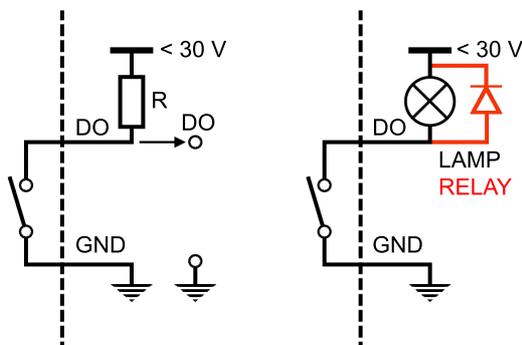
5.25. Analog out option

The analog output option adds 8 analog output channels (BNC connectors) to the SIRIUS® slices and supports 4 different operation modes:

- Standalone digital signal conditioner
- Function Generator (Modal/Shaker control)
- File replay to analog
- Channel Output

Important

For SIRIUS Function Generator option a software license is required!

Important

- The Analog output Function generator option is only available with USB connection.
- The Analog out Signal conditioning option in HD - High Density SIRIUS slice is possible for the first 8 channels only.
- The Multi modules have the analog out channels per default on the front side connectors. When you order a Multi module with additional analog out OPTION, the front side analog out will NOT be connected – only the analog out of the rear BNC connectors.
- Please note that signal conditioning does not support non linear sensors such as resistance or RTD measurements.

Important

When using R2 HUB, R4 HUB, R2/R4, R8 Systems it is recommended not to switch slices if not all the slices have the AO option. The analog output module is screwed on the back side of the system and it does not move with the slice. The AO option might not work with the other slice if not recalibrated.

5.25.1. Analog out: Specifications

Outputs	Voltage		
DAC Type	24-bit delta-sigma		
Sampling Rate	Simultaneous 200 kS/sec		
Number Of Channels	8		
Function	File replay, conditioned AI output, FGEN (software option), channel output		
Specifications			
Full Scale	±10 V		
Analogue out bandwidth	40 kHz		
Accuracy	±0.1 % of reading ±0.02 V		
Temperature Drift	±50 ppm/K of reading ±200 µV/K		
Output configuration	Single Ended		
Typ. Noise floor @ 50 (200) kS/s output rate	-95 dB (-86 dB) @ 100 kHz Bandwidth		
Inter channel phase mismatch	0.1° * fout [kHz] + 0.1°		
THD	< -90 dB @ 1 kHz, 10 Vpeak-peak		
Output Impedance	< 1 Ω		
Maximum Output Current	20 mA		
Maximum load	> 1000 Ω		
Output Protection	Continuous short to ground		
Signal Delay	**100 S/s...50 kS/s**	**50 kS/s...100 kS/s**	**100 kS/s...200 kS/s**
Signal conditioning mode (see 1)	14 Samples + 50 µs	19 Samples + 2 µs	12 Samples + 35 µs
Additional Specifications			
Output connector	BNC		
1) SIRIUS-HD series supports signal conditioning only for channels 1-8			
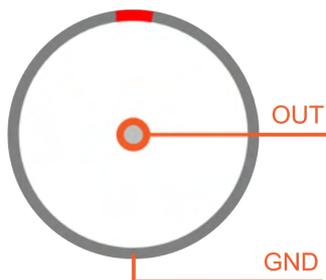
Analog Out connector: pin-out (BNC)

SIRIUSi with 8xAO (rear side)

5.25.1.1. Output oversampling

The analog output channels use a special oversampling technology to produce accurate output results. The illustration shows the output of a standard measurement system (green signal) in comparison to the oversampled output of a SIRIUS® system (red signal). You can see that the SIRIUS® output looks like it was sampled with 1 MHz, although the real sampling rate of the output signal is only 200 kHz.
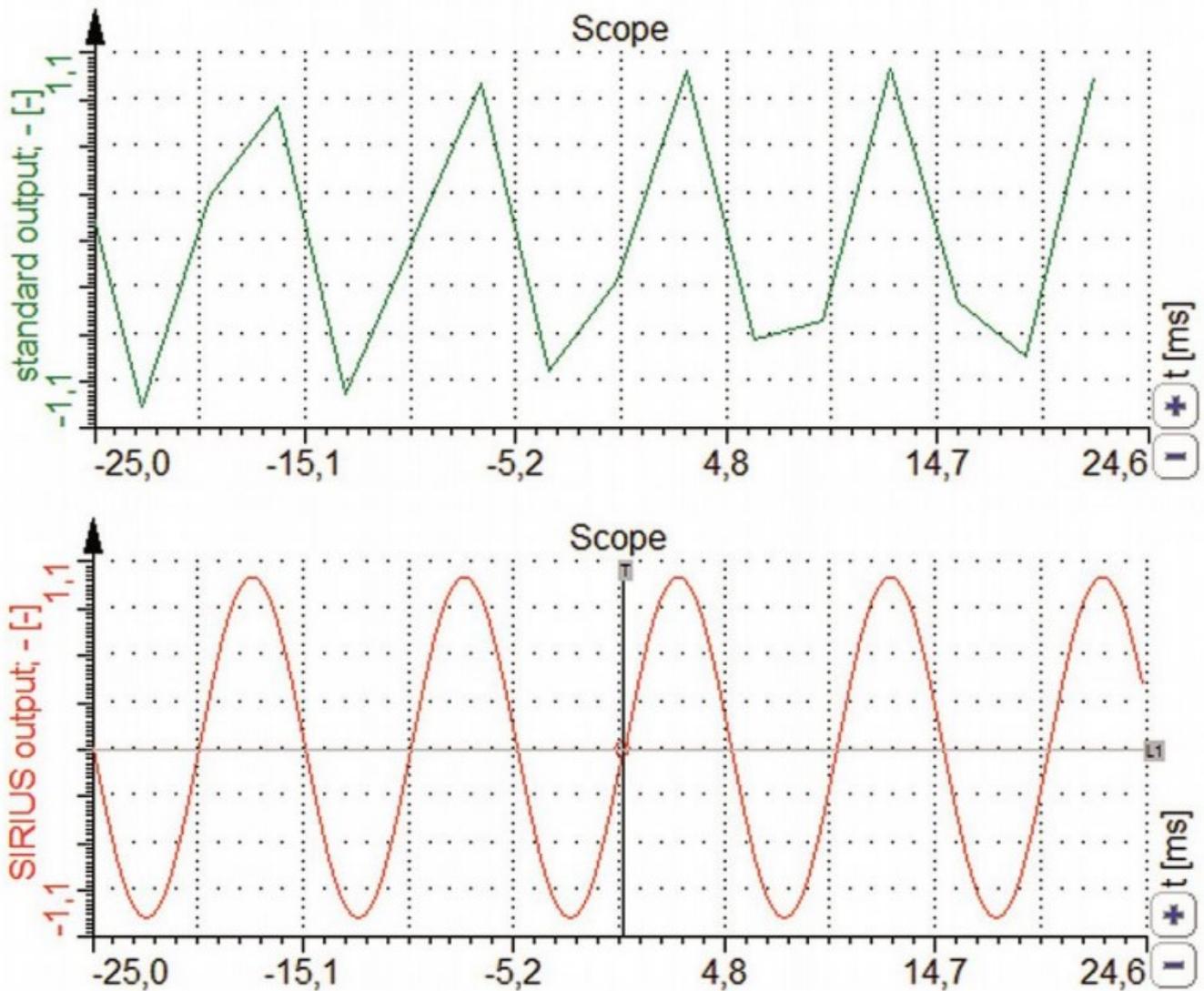
5.25.2. Standalone digital signal conditioner

In this mode, you use DewesoftX® to do the configuration once and then you can use the SIRIUS® slice, a pure, standalone signal conditioner. Just connect the power-supply and the signal amplifier will be operational: No PC, DewesoftX® software, USB connection required. Since the signal processing is done in the SIRIUS PL logic there is only a minimal delay of some 10 samples between the input and output. Any physical input signal is converted to an output voltage of max. ±10 V.

Features:
- Input: any analog channel
- Signal conditioning
    - Scaling
    - Offset
    - Gain
- Redundant DAQ system
    - Simple math functions
- Standalone operation possible
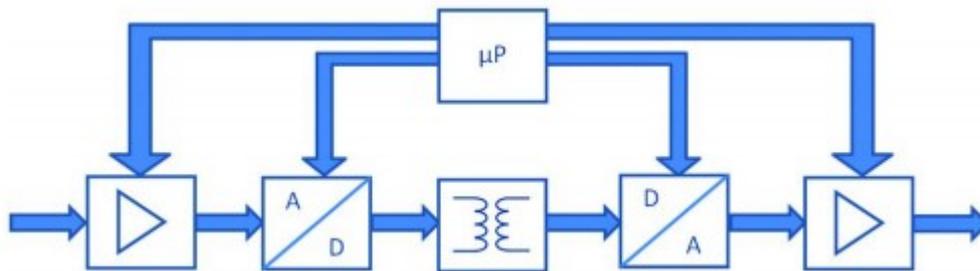
Principle of Signal conditioning

5.25.3. Function generator (Modal / Shaker control)

The Function Generator (DewesoftX® software feature) is able to output signals like sine, triangle, rectangle, saw or even an arbitrary table. This can be done continuously or in Sweep / step sweep / burst / ... and many more. Fine-tuning can be done LIVE during measurement.

First, add the Function Generator feature to your channel setup:
Click the More... button ❶ and then select Function Generator ❷:
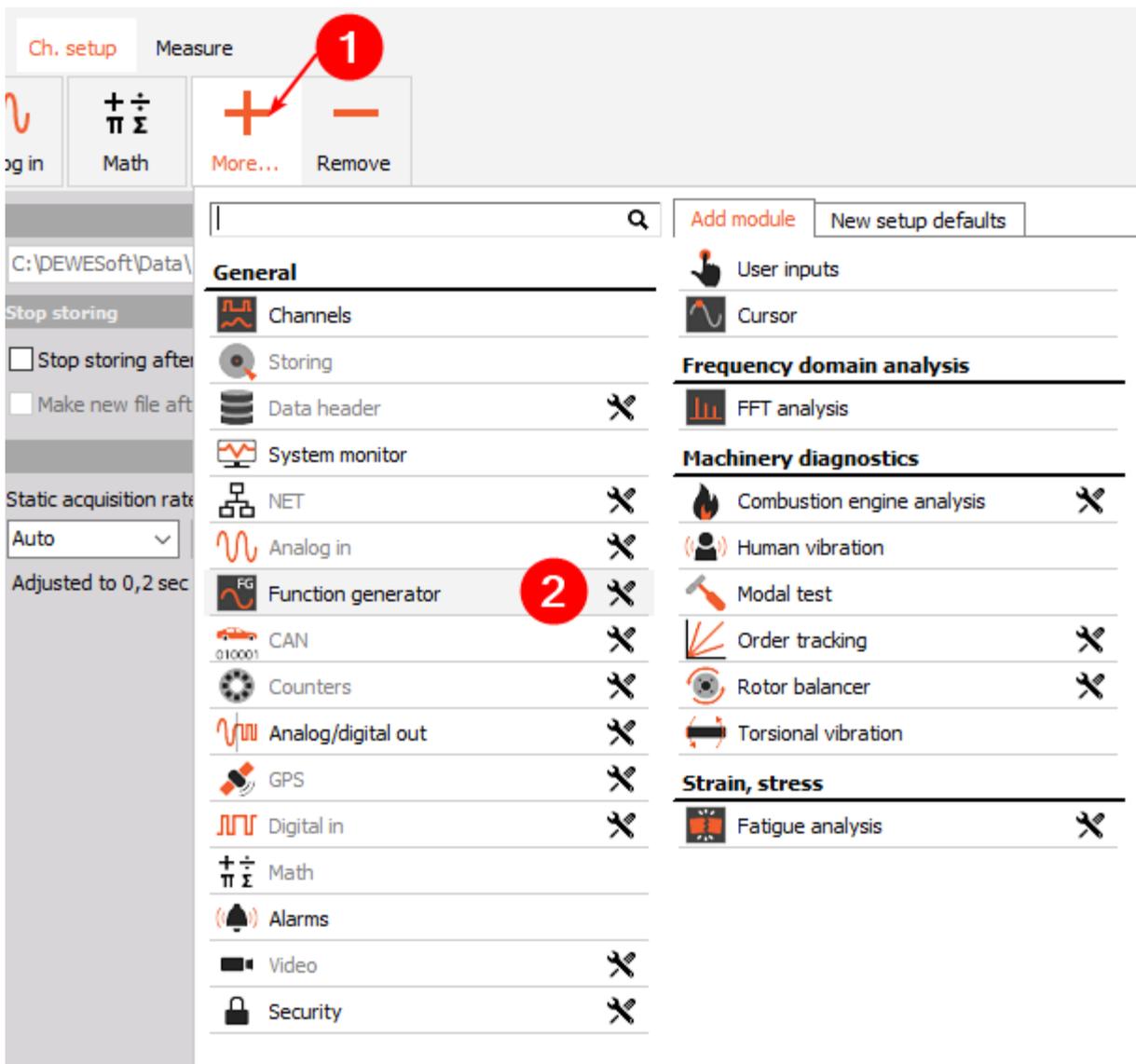
Now you will see the icon of the Function Generator feature in Channel Setup and can configure it accordingly. You can choose the Function generator mode ❶ and select the waveform for each channel ❷:

When you do your measurements, you will see a new icon for the Function Generator ❶. When you click it, you will see controls to change the Function Generator settings LIVE during measurement:
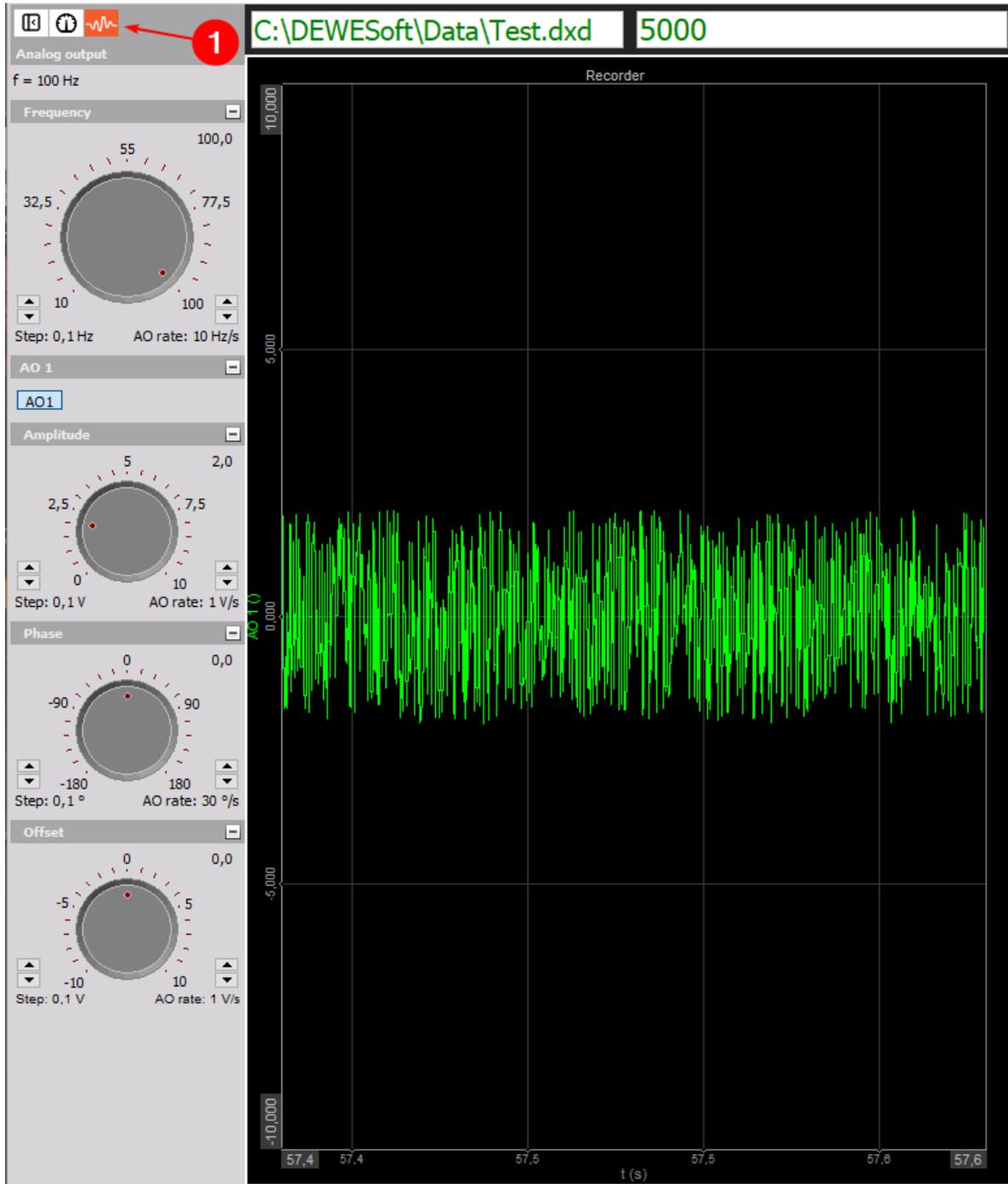
5.25.3.1. File replay to analog

After the measurement is done, replay your data file and put out the conditioned channels on the rear side BNC connectors for post-analysis. Use SIRIUS® to feed a test-bed and simulate e.g. the vibrations during a test drive.
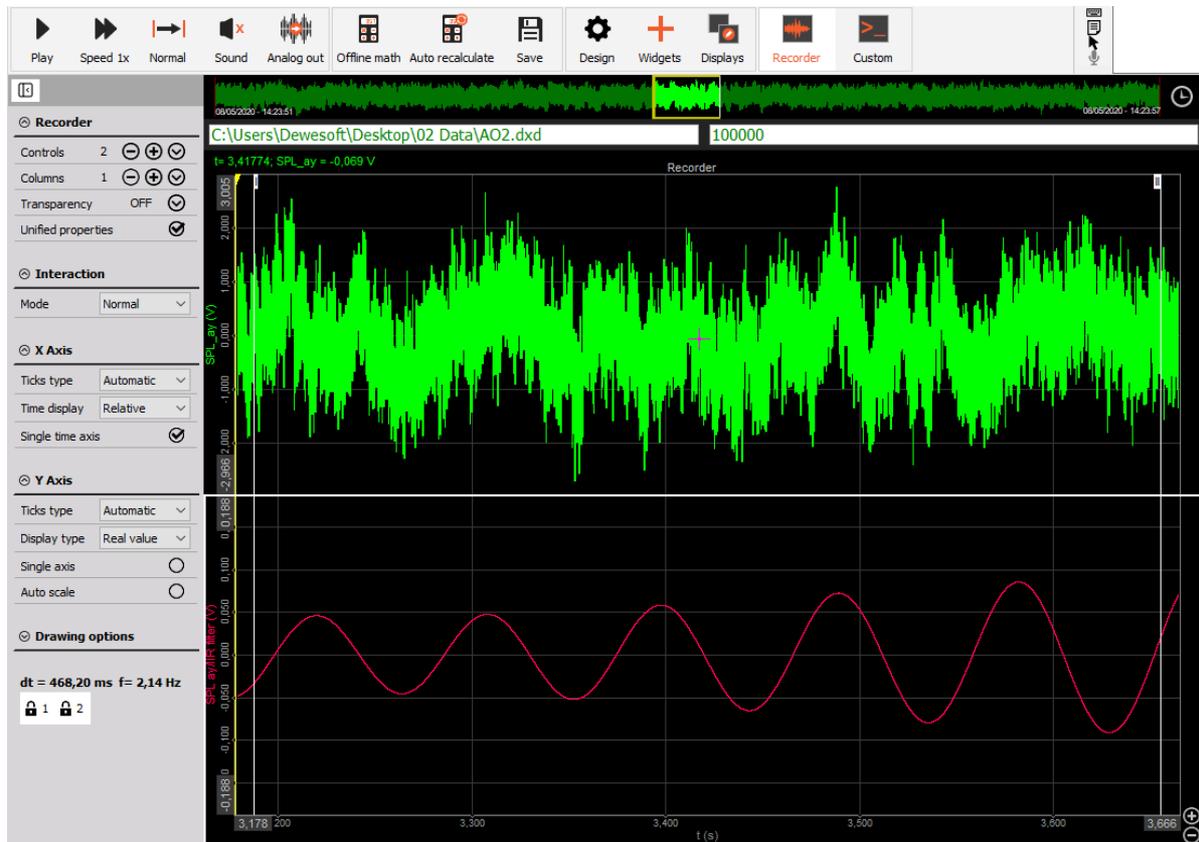
5.25.4. Channel output

You can use DewesoftX® to output any channels to the analog out BNC connectors. There are different ways to do that:

5.25.4.1. Manual via Input Controls

You can use Input control displays to manually change the values of the analog out channels during measurement. In Design mode, drag&drop a new Input control display to the measurement screen. The default display type is Input field. You can enter a numeric value in the field and press enter to change the analog output value. You can change the display type via the drop-down-list ❶.
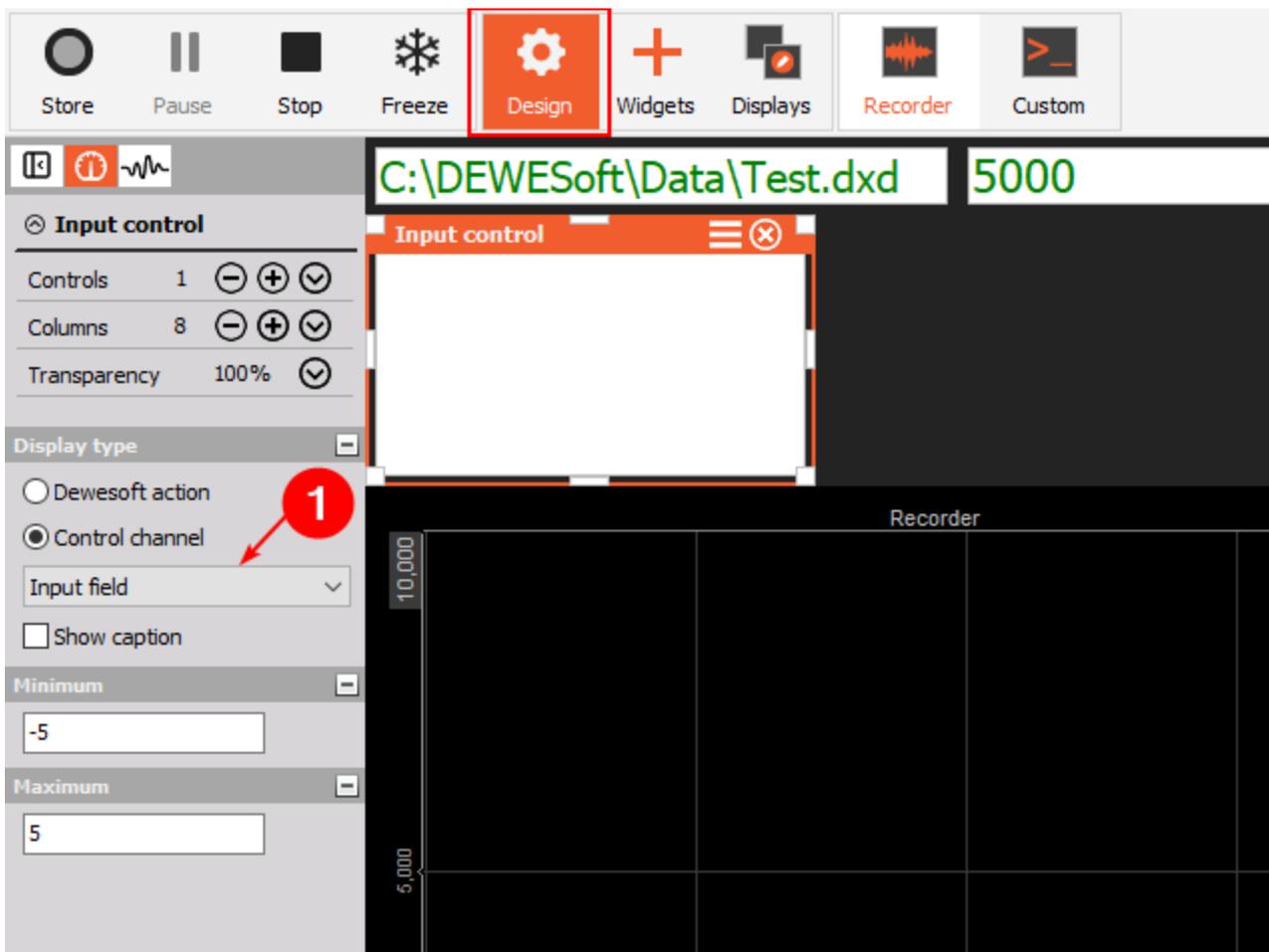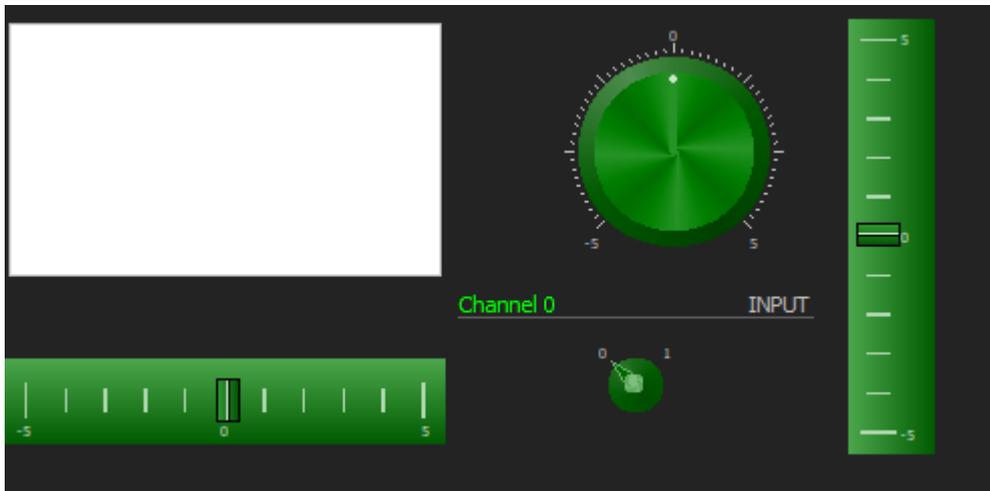
5.25.4.2. Asynchronous output mode

First, add the Analog/digital out feature to your channel setup. Click the More... button and then select Analog/digital out .
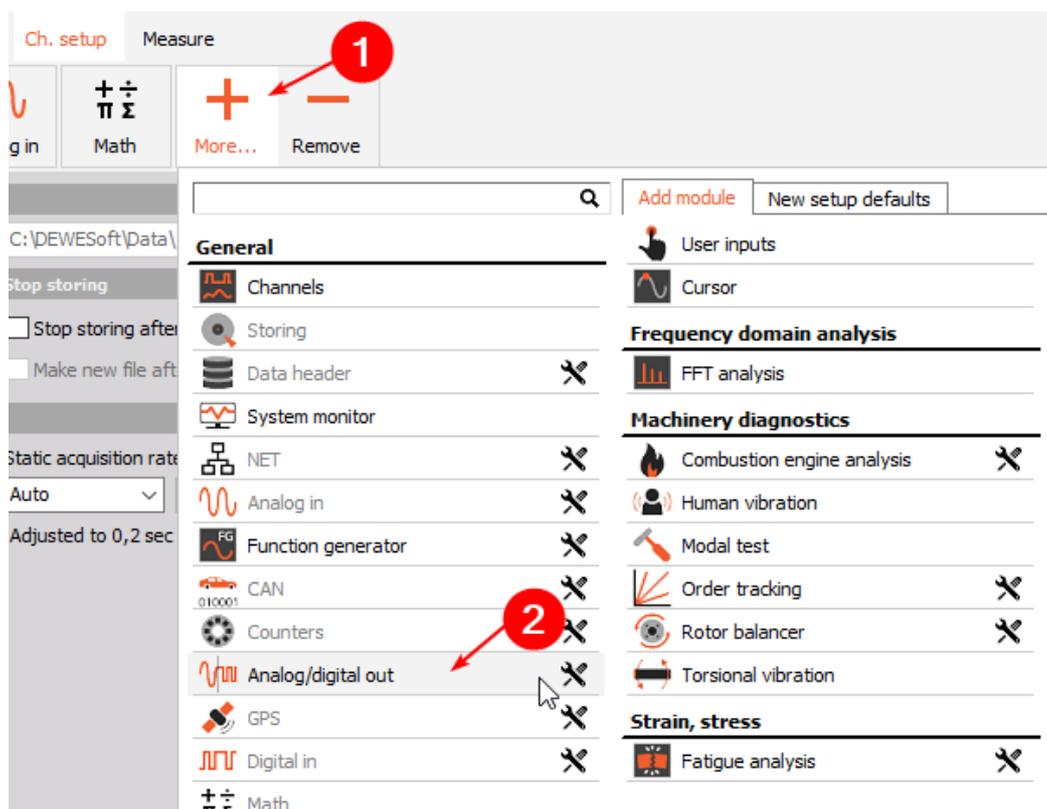
Then, select Value type to From channel and now you can select the Dewesoft channel from the drop-down which will be used as input for the analog output channel. During measurement DewesoftX® will periodically write the current value of the input channel to the output channel: except a delay of some ten milliseconds.

5.25.4.3. Synchronous output mode

First, add the Function Generator feature to your channel setup: Click the More… ❶ and then select Function Generator ❷.
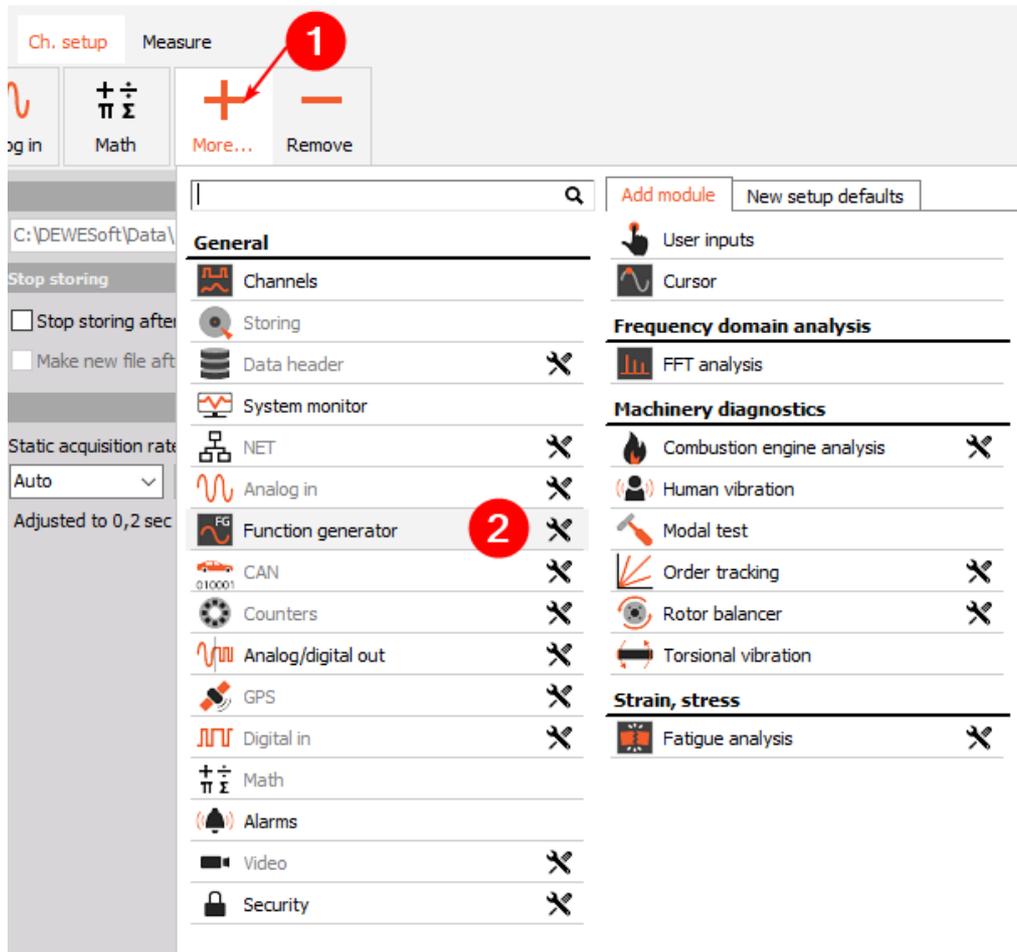
In the Function Generator Channel Setup, select channel output mode 1 and now you can select a synchronous DewesoftX® channel as input 2 . During measurement DewesoftX® will keep a short buffer of the input channel and then write the buffer to the output channel: i.e. the output channel will be delayed by about 1 second.
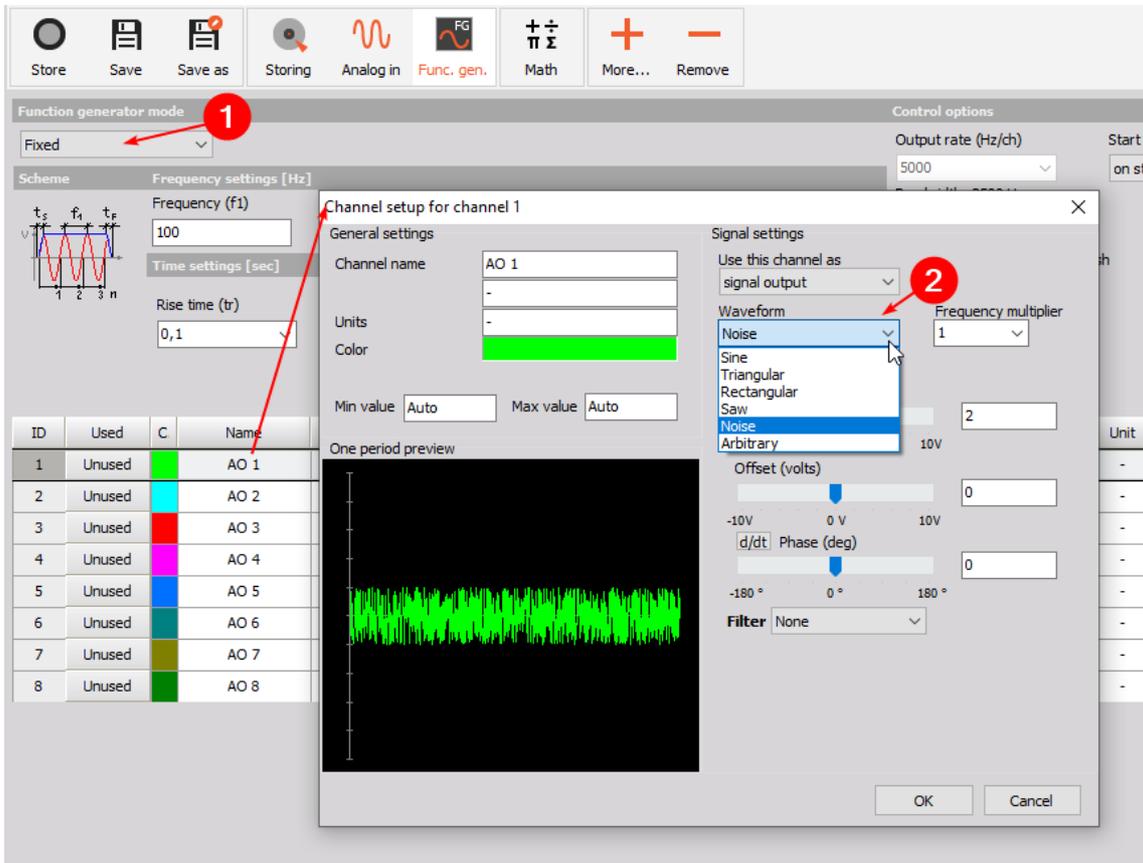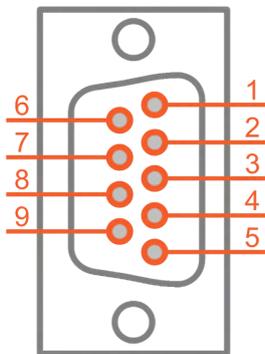
5.26. CAN: Controller Area Network

CAN port on SIRIUS rear side

5.26.1. CAN port

5.26.1.1. CAN port: Specifications

CAN bus	
Number of ports	1
Interface type	CAN 2.0B, up to 1 MBit/sec
Special applications	CCP, OBDII, J1939, CAN output
Galvanic isolation	Isolated (only on isolated motherboard)
Bus pin fault protection	±36 V
ESD protection	8 kV

5.26.1.2. CAN port: DSUB Connector: Pinout

CAN connector: pinout (DSUB-9 male)

Pin	Name	Description
1	+5V	5 V supply max. current: 500 mA
2	CAN_LOW	CAN low
3	DGND	Digital Ground
4	RES	Reserved
5	RES	Reserved
6	DGND	Digital Ground
7	CAN_HIGH	CAN high
8	RES	Reserved
9	+12V	12 V supply max. Current: 200mA

5.26.2. CAN devices
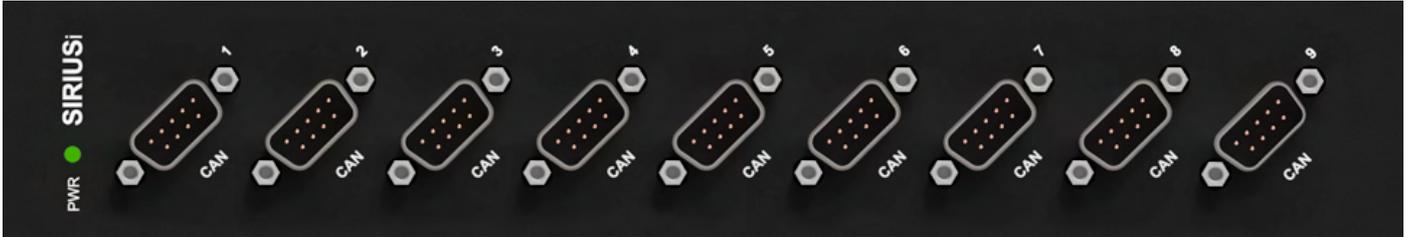
SIRIUSir-9xCAN

SIRIUSi-8xCAN, SIRIUSif-8xCAN

SIRIUSiw-8xCAN

6. Measurement

This chapter covers topics that you should be aware of when doing your measurement with SIRIUS®.

6.1. Filtering

This chapter covers the filtering capabilities of the SIRIUS® measurement modules and of the DewesoftX® measurement software.

6.1.1. Filtering glossary

This chapter describes some important terms related to filtering.

6.1.2. Frequency response

The frequency response of a filter can be classified into a number of different band-forms describing which frequency bands the filter passes (the passband) and which it rejects (the stop-band). To discuss the SIRIUS® filtering, we only need to consider 2 types frequency response:
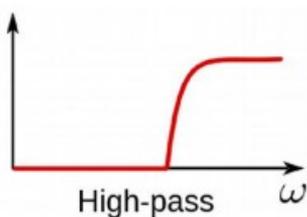
Low pass filter

Low frequencies can pass, high frequencies are attenuated.
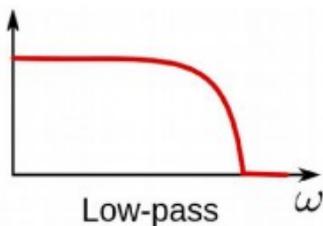
High pass filter

High frequencies can pass, low frequencies are attenuated.

6.1.3. Bandwidth

Bandwidth is the difference between the upper and lower frequencies in a continuous set of frequencies. It is typically measured in hertz, and refers to the baseband bandwidth in the context of this chapter: In the case of a low-pass filter or baseband signal, the bandwidth is equal to its upper cut-off frequency.

If the maximum gain is 0 dB, the 3 dB bandwidth is the frequency range where the gain is more than −3 dB, or the attenuation is less than 3 dB.

The image below "3 dB Bandwidth" shows the definition of bandwidth (B) for a bandpass filter. f_0 is the centre frequency, f_H is the higher cut-off frequency, and f_L is the lower cut-off frequency. The 0 dB level is the level of the peak of the bandpass response, which is not necessarily located at the centre frequency. Also the centre frequency is located at either the arithmetic or geometric mean of the upper and lower cut-offs depending on context and conventions.

3 dB bandwidth
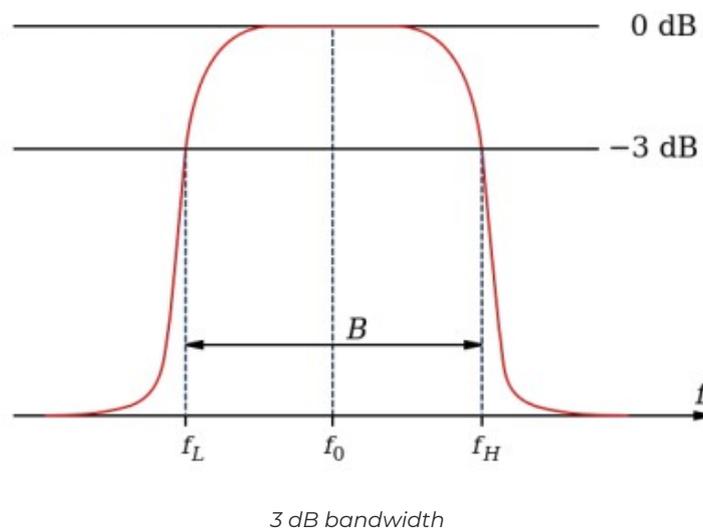
6.1.3.1. Filter order

An ideal filter has full transmission in the pass band, complete attenuation in the stop band, and an abrupt transition between the two bands. In practice an ideal filter is not possible and can only be approached to a certain degree. The higher the filter order, the more the filter will approach the ideal filter; but this also means that the impulse response will be longer and that the latency will increase. In the illustration below "Filter order" you can see three analog filters (2nd, 4th and 8th order) and the SIRIUS® filter (which is a combination of analog filter, oversampling and digital filter). Note, that filters with higher order have a sharper damping around the filter frequency:
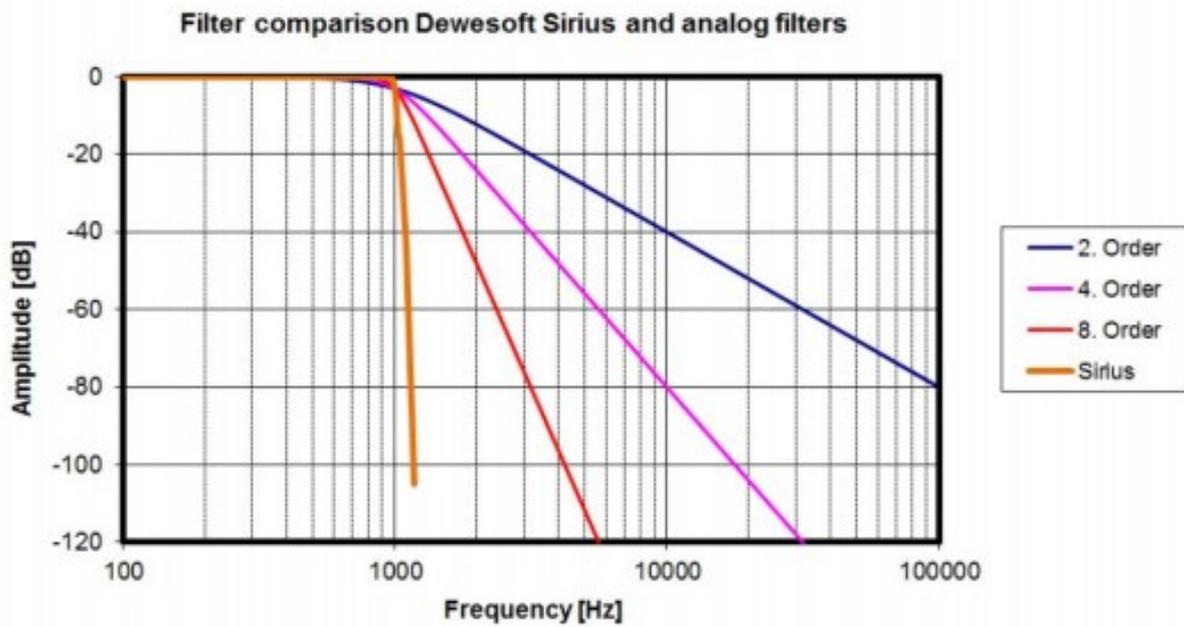

Filter order

6.1.3.2. Aliasing

In signal processing, aliasing is an effect that causes different signals to become indistinguishable (or aliases of one another) when sampled.

When signals are sampled , the sampling frequency must be at least twice as high as the maximum frequency of the signal to avoid errors: this is called Nyquist theorem (Aliasing effect).

The illustration below shows an example of aliasing. The red sine wave is the original signal that we want to measure. But our sampling frequency is too low (the sampling points are shown as black lollipops). When we now reconstruct the sine wave by interpolating the sampled points, we get the blue signal, which is also a sine-wave, but has the wrong frequency!
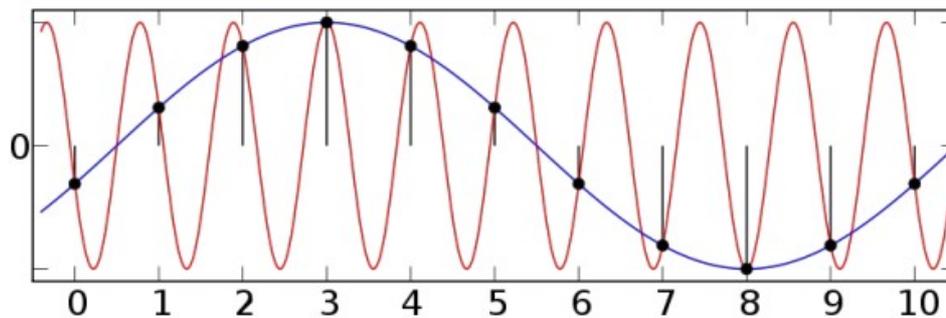
Aliasing effect

Real world measurement signals are hardly ever pure sine waves and can thus have many components (harmonics) above the Nyquist frequency. These harmonics are erroneously aliased back to the baseband and thus added to parts of the accurately sampled signal which produces a distorted measurement signal. Filtering can be used to block frequencies above the Nyquist bandwidth (which is half of the sample rate), to get correct measurement results.

Hint
To get a better understanding of the aliasing effect, we recommend to take the DewesoftX® PRO training course: Spectral analysis using the FFT:
https://training.dewesoft.com/online/course/fft-spectral-analysis

Our professional online training courses are available free of charge to registered users of our homepage.

Important
To avoid aliasing, we must cut all frequencies that are higher than half of the sample rate. But on the other hand, we do not want to damp the amplitude of the signal below the Nyquist frequency. To meet both goals, we need a filter (in this context called: anti-aliasing filter) with sharp damping at half of the sampling rate (which requires a high order filter).

6.1.3.3. Aliasing-free Bandwidth

In the previous chapters we have learned that an ideal filter with infinitely sharp filter characteristics is not possible in real-world applications.

The frequency response in the image below "Bandwidth vs. Aliasing-free Bandwidth" shows the bandwidth (-3 dB point) at about half of the sampling rate (Nyquist criteria). All frequencies higher than the Nyquist frequency will be folded back. But the frequencies above the Filter Stop-band are already attenuated so much that they are negligible. Thus, the only guarantee that can be made, is that all frequencies in the aliasing free bandwidth are correct.
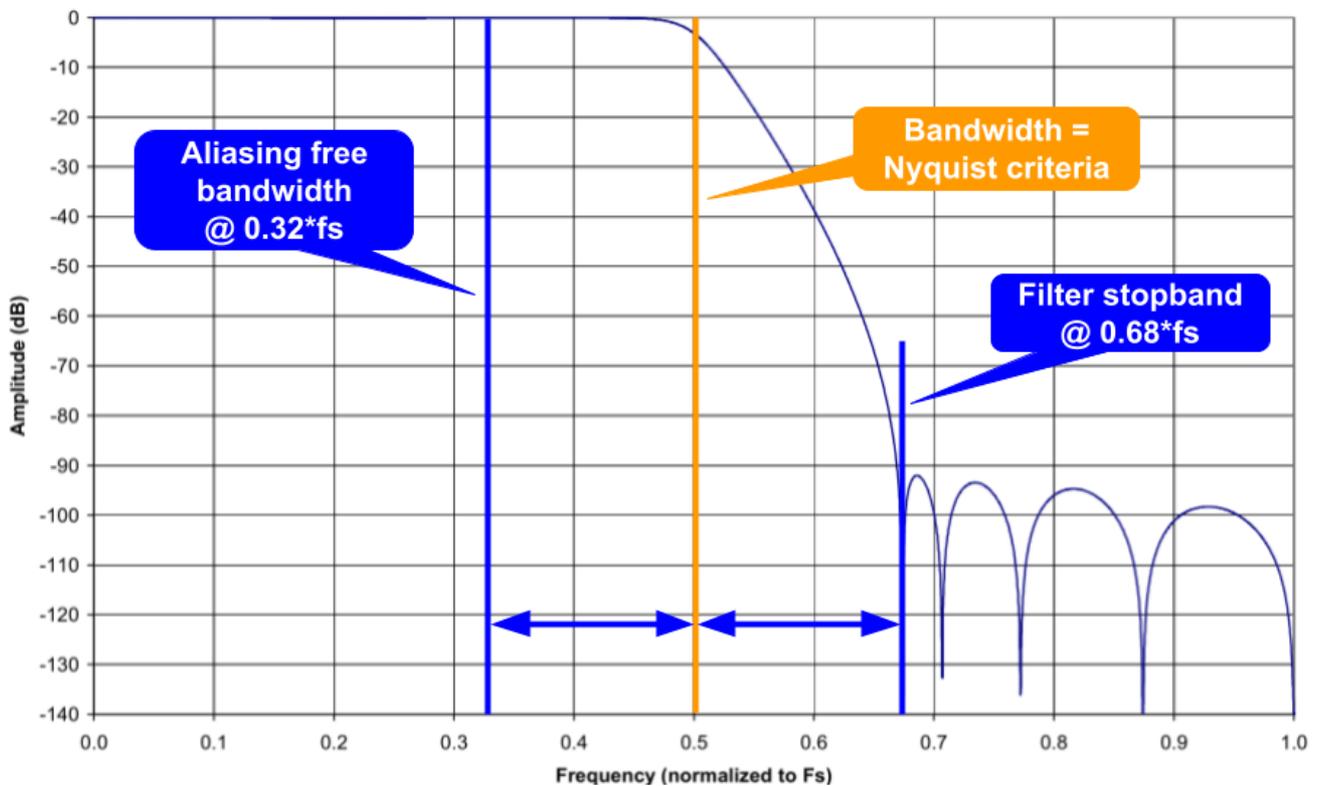
Bandwidth vs. Aliasing-free bandwidth

The illustration above shows the filter characteristics relative to the sample rate. To make it easier to understand, let's make an example with some concrete values:

🛠 Example

Let's assume a sampling rate of 1000 S/sec or 1000 Hz. The bandwidth of this low-pass filter is at 500 Hz. All input frequencies between 500 Hz and 680 Hz (= 0.68 * 1000 Hz) can be folded back to the 320 Hz to 500 Hz range. All input frequencies higher than 680 Hz are rejected by the filter anyway and can be ignored. Thus, the aliasing free bandwidth is 320 Hz (since the range of 320 Hz and 500 Hz can already be due to the aliasing effect).

6.1.3.4. Filter technologies

Different technologies can be used to realise a filter. In this context we only need to consider two technologies: analog and digital filters.

Analog filters

Analog filters are composed of passive electronics (i.e. capacitors, inductors, resistors) and operate on continuously varying signals. They can be described with linear differential equations: thus they are also called passive linear analog electronic filters.

Good analog filters are inherently difficult to design and even when you select all components carefully, 8th order is the best you can implement without significant inter channel phase mismatch.

Digital filters

A digital filter is a system that performs mathematical operations on a sampled, discrete-time signal to reduce or enhance certain aspects of that signal. In comparison to analog filters, digital filters require complex electronics (i.e. a digital signal processor – aka. DSP) to calculate the filter results.

There are 2 types of digital filters that will be used in the following discussion:

IIR filter

In theory the impulse response of an IIR (Infinite Impulse Response) filter does not become exactly zero past a certain point, but continues indefinitely. In practice, the impulse response even of IIR systems usually approaches zero and can be neglected past a certain point. IIR filters can have the same characteristics as analog filters.

The main advantage that digital IIR filters have over FIR filters is their efficiency in implementation. A disadvantage is that the linear phase is difficult to achieve.

FIR filter

A FIR (Finite Impulse Response) filter, is a filter whose impulse response (or response to any finite length input) is of finite duration, because it settles to zero in a finite time.

An FIR filter has a number of useful properties which sometimes make it preferable to an infinite impulse response (IIR) filter. FIR filters:

- require no feedback: i.e. any rounding errors are not compounded by summed iterations,
- are inherently stable: since the output is a sum of a finite number of finite multiples of the input values,
- can easily be designed to be a linear phase.

The main disadvantage of FIR filters is that considerably more computation power is required compared to an IIR filter with similar sharpness or selectivity, especially when low frequency (relative to the sample rate) cut-offs are needed.

However many DSPs (digital signal processors) provide specialized hardware features to make FIR filters approximately as efficient as IIR for many applications.

6.1.3.5. Oversampling

Oversampling means that the sampling rate of the ADC is significantly higher than its output rate. Oversampling improves resolution, reduces noise and helps avoid aliasing and phase distortion by relaxing anti-aliasing filter performance requirements.

Example

When we want to measure a 1 kHz sine-wave signal, the Nyquist theorem dictates that we need at least a sample rate of 2 kHz. When we now sample the signal with 4 kHz (instead of the minimum required 2 kHz), we oversample by the factor of 2.

6.1.4. Filter design

Since ideal filtering is not possible, we need to carefully design our filters to achieve the desired results.

One important goal is that we want to have very sharp damping, so we need a high order filter, which in turn means that we will use a digital filter. Moreover we want to have a linear phase, so we choose a FIR filter (the performance of the DSP in SIRIUS® is powerful enough to handle this demanding computation).

Another important goal is to minimize errors introduced by aliasing. So the FIR filter alone will not be sufficient (since digital filters are subject to aliasing).

In the following examples, we assume that we want to measure a signal between 0 and 800 Hz and we will consider how higher frequency components in the input signal affect the measurement result.

6.1.4.1. Sampling and digital filter

Our first try is quite naïve: we sample the signal at 2 kHz (over twice the frequency that we are interested in) and then apply a digital filter. Illustration below "Sampling and Digital Filter" includes 3 diagrams (from top to bottom):

- Input Signal: e.g. the analog signal that we input to the AD converter
- Sampled Signal: the output of the AD converter
- Filtered Signal: the output of the digital filter (the filter input is the Sampled Signal)
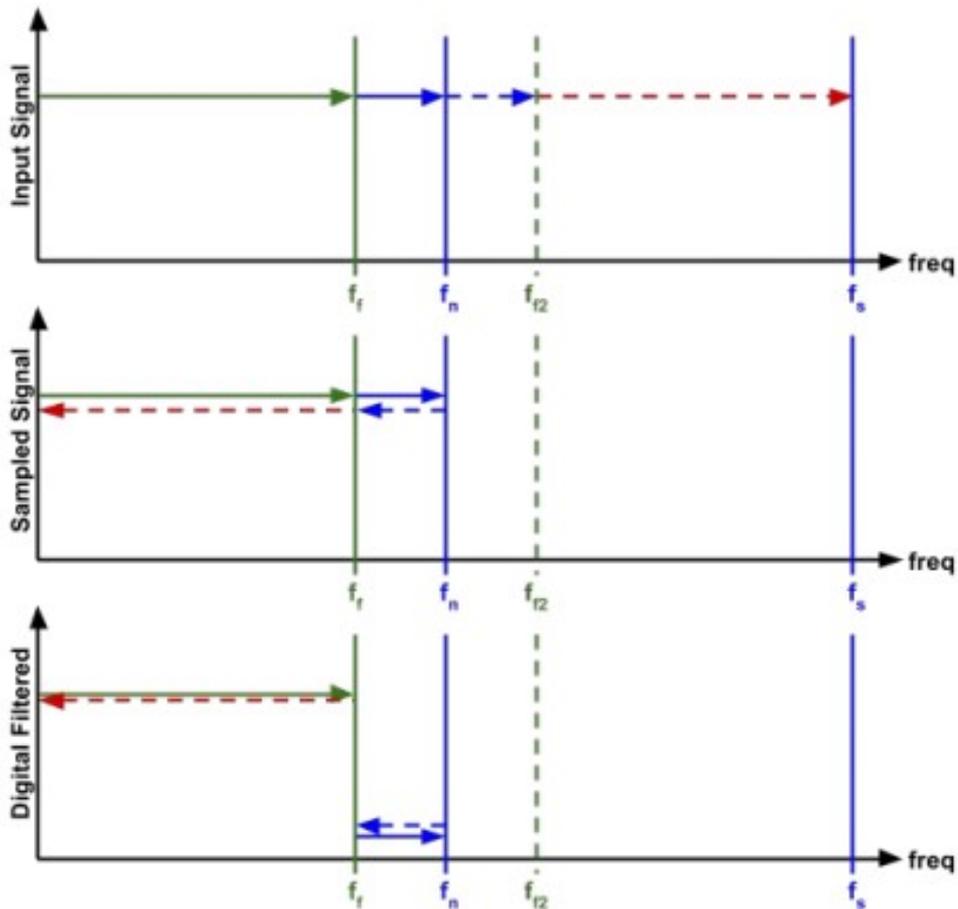
Sampling and digital filter

Example

Legend for illustration "Sampling and digital filter", from left to right:

- f_f: Filter frequency: e.g. 800 Hz
- f_n: Nyquist frequency: e.g. 1 kHz
- f_{f2}: f_s-f_f = 1.2 kHz
- f_s: Sampling frequency: e.g. 2 kHz

Sampled Signal: Since we have a sampling frequency of 2 kHz all signals over 1 kHz are folded back to the Nyquist band (due to aliasing) when they are sampled by the AD converter (dashed lines in Illustration "Sampling and Digital Filter"). Thus the Sampled Signal will already contain the wrong signal components.

The digital filter will now attenuate all frequencies of the Sampled Signal (which already contains the aliased signals) that are higher than 800 Hz.

Filtered Signal: Now the measurement result is wrong, because it also contains the aliased frequencies from the input signal (the red dashed line). Note, that we don't care about the aliased signal of the blue dashed line because this is still higher than 800 Hz.

> **Hint**
> Solution to the example described above will be described in the following chapter "Oversampling and digital filter".

6.1.4.2. Oversampling and digital filter

Now, let us consider the effects of oversampling. Let's assume that we oversample by a factor of N = 5. This means that our AD converter will now sample at a speed of 2 kHz * 5 = 10 kHz and so the Nyquist frequency is 5 kHz.
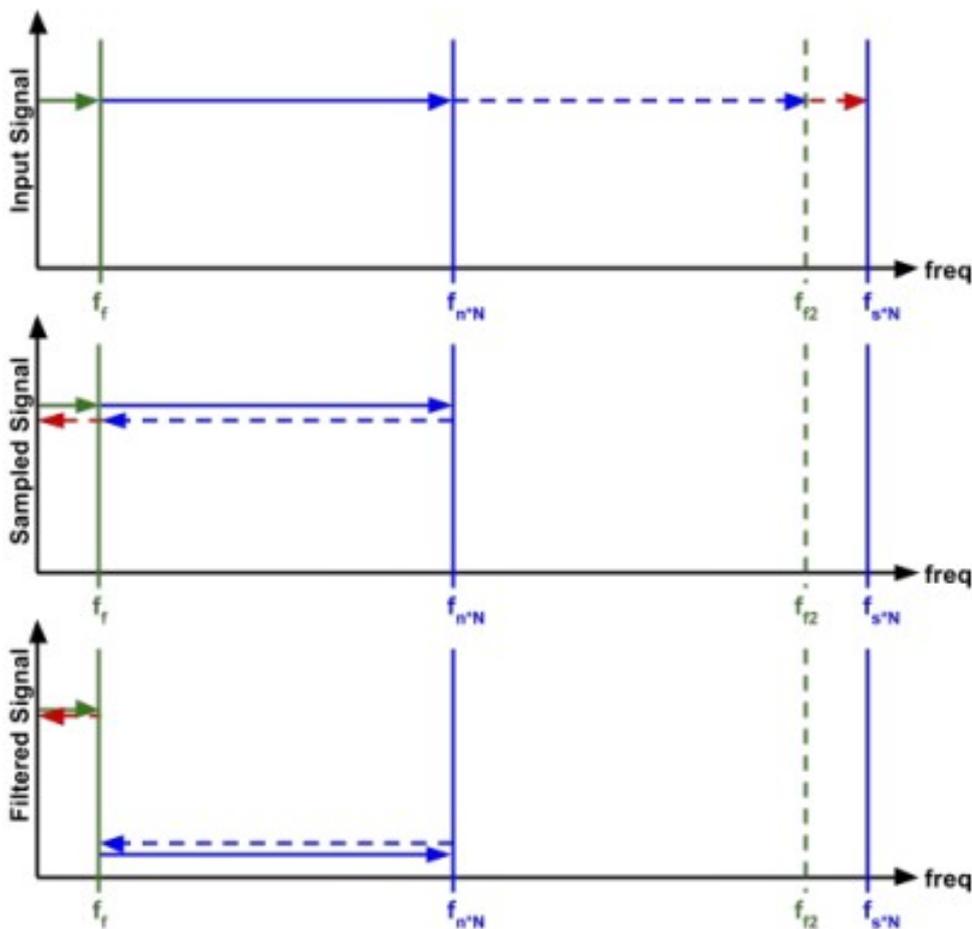
Oversampling and digital filter

Example

Legend for illustration "Oversampling and digital filter", from left to right:

- f_f: Filter frequency: e.g. 800 Hz
- $f_n * N$: Nyquist frequency: e.g. 5 kHz
- f_{f2}: fs * N - f_f = 9.2 kHz
- $f_s * N$: Sampling frequency (oversampling): e.g. 10 kHz

In comparison to the previous example (without oversampling), you can see that we get basically the same result – only the range of the wrong signal components (red-dashed line) is now much smaller. So oversampling somewhat improves the result, but it's still not perfect. We need to find a way to reduce the impact of the troublesome signal part (the red-dashed line).

Hint

Solution to the example described above will be described in the following chapter "Analog Filter, Oversampling & Digital Filter".

6.1.4.3. Analog filter, oversampling & digital filter

As a final step, we now apply an analog filter to the input signal before the AD converter (which uses oversampling).

Illustration below: "Analog filter, oversampling and digital filter" contains 4 diagrams – each of them shows the analog filter curve as an orange line. The 4 diagrams (from top to bottom) show:

- Input Signal: e.g. the analog signal that we input to the AD converter
- analog Filtered: the output of the analog filter
- Sampled Signal: the output of the AD converter
- Digital Filtered: the output of the digital filter (the filter input is the Sampled Signal)
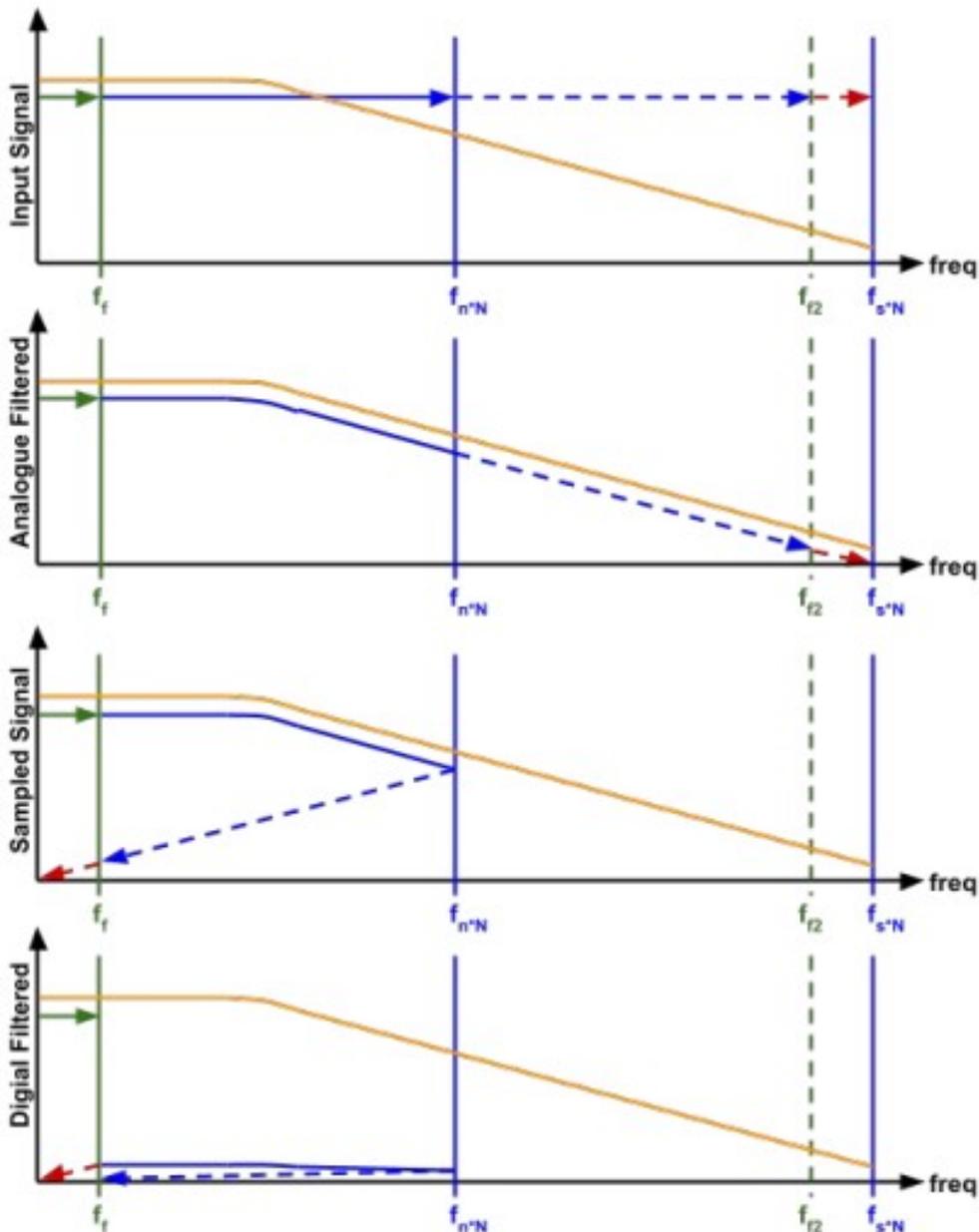
Analog filter, oversampling and digital filter

You can see that the analog filter does not have a very sharp damping – but this is not required. The important thing is, that the attenuation of the analog low-pass filter increases for higher frequencies.

Analog filtered: The troublesome part of the input signal (red dashed line) is already highly damped before we even sample it! Also some other parts of the input signal are damped – but those parts are way higher than the frequency range that we are interested in f_f: so this is also not a problem.

Sampled Signal: the sampled signal shows the same folding effect as before, but this time the aliased frequencies have only very little amplitude (because of the analog filter).

Digital Filtered: the final digital FIR filter (with a sharp damping) further attenuates all signals above (f_f), so that we get an excellent measurement result over the whole frequency range (i.e. the effect of the aliasing is negligible).

Important

Illustration below "Filtering components in SIRIUS® DualCore and HD modules" shows an overview of the components in the SIRIUS® DualCore and HD modules: after the input amplifier there is an analog filter followed by the ADC which uses oversampling and includes a Digital ADC Filter, so that we can get excellent aliasing free measurement results.
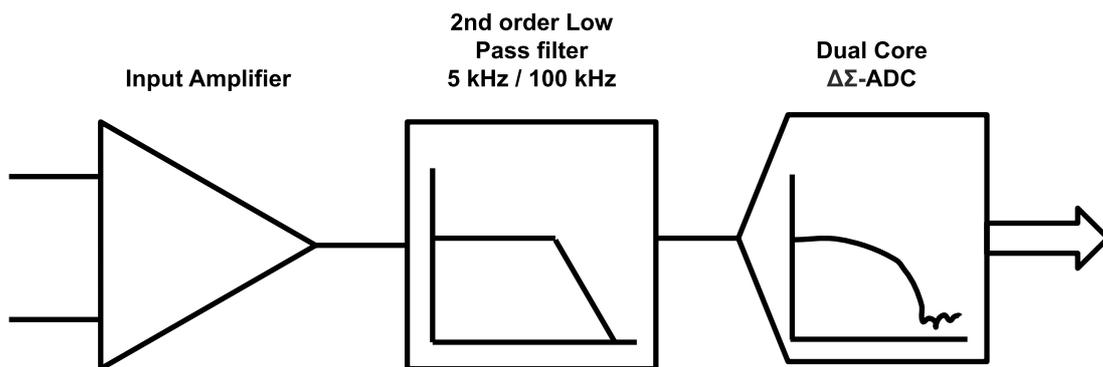
Filtering components in SIRIUS® DualCore and HD modules

6.1.5. SIRIUS® Dual Core & HD: Anti-Aliasing

To get the best possible anti-aliasing results, Dewesoft uses a combination of multiple technologies: analog filtering, oversampling and digital filtering.
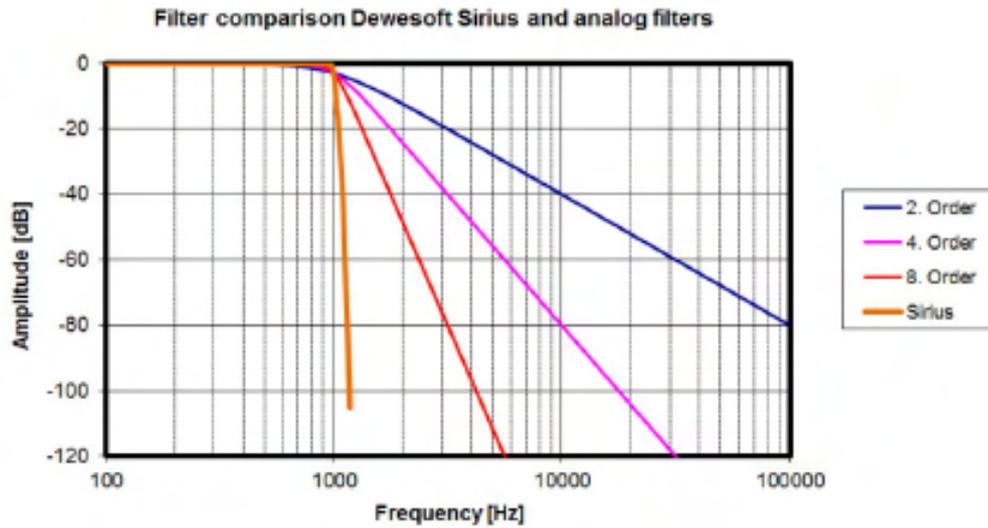
*Filter comparison: SIRIUS® DualCore vs. analog filters*

6.1.5.1. Analog filter

The analog filter in the SIRIUS® modules is a 2nd order low-pass Butterworth prototype filter which will switch its filter frequency automatically depending on the sampling rate.

Important

When the sampling rate is set to 2kS/s or lower, the analog filter frequency is set to 5 kHz, otherwise the 100 kHz analog low-pass filter is used. Additionally, if the low-pass filter is set at 1kHz in DewesoftX, the 5 kHz analog filter is automatically used. When a low-pass filter of 3 kHz or more is selected, then the 100 kHz analog filter is used.

Analog Filter Response

— 100k LP

## Analog Filter Response

— 5k LP
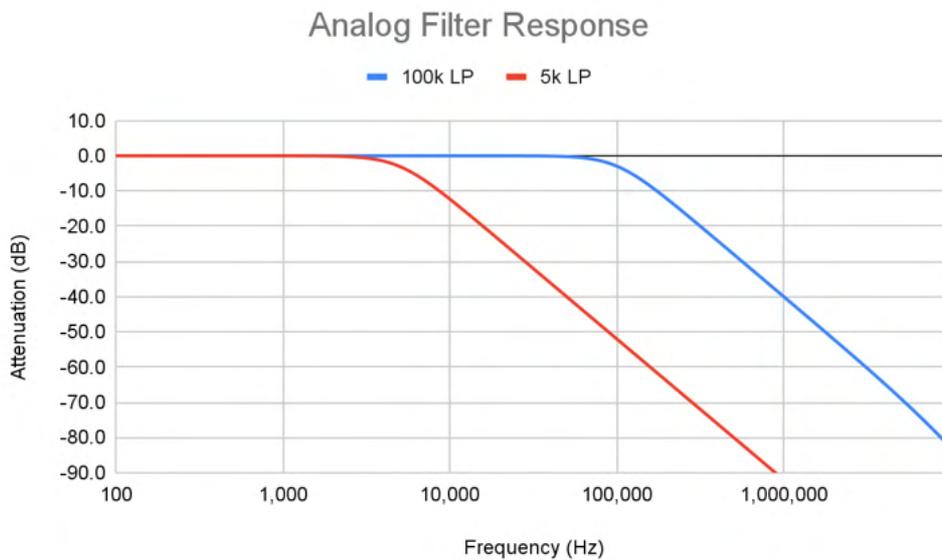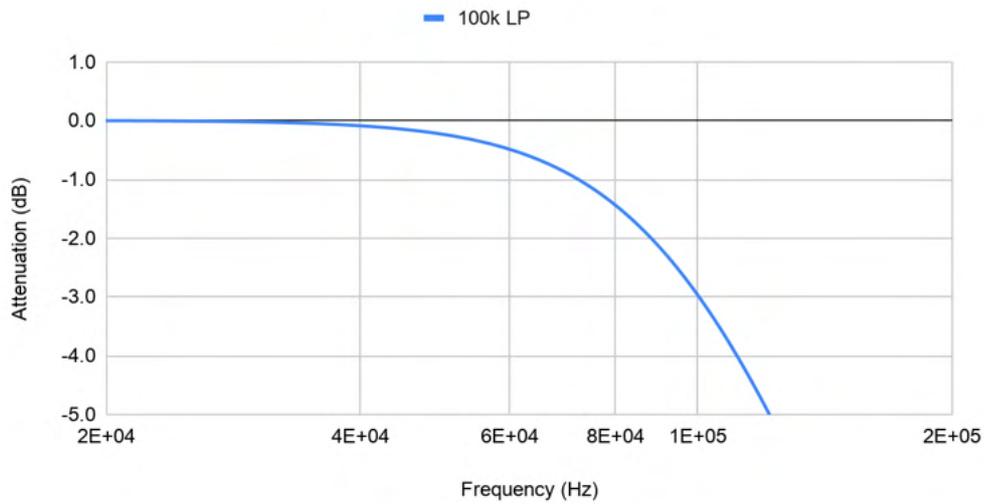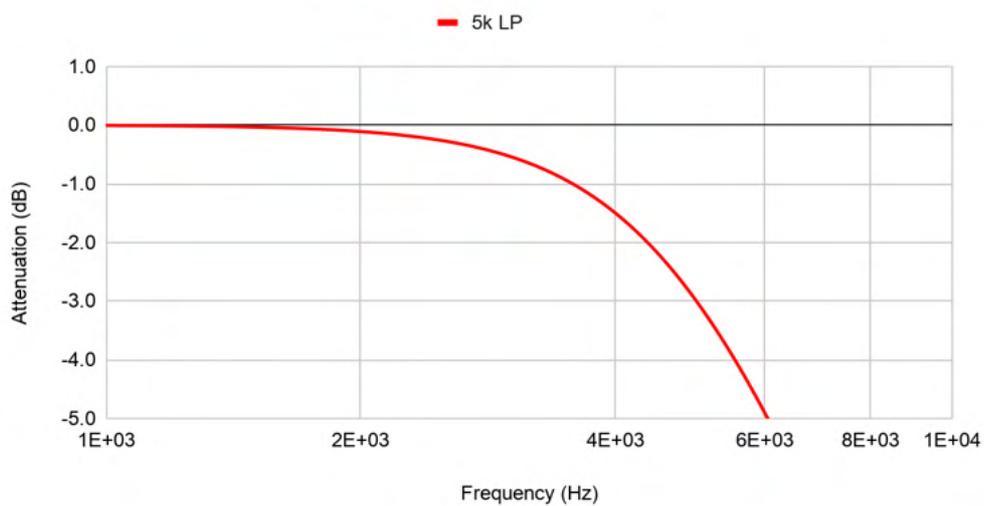
6.1.5.2. ADC digital filter and oversampling

SIRIUS® will automatically adjust the oversampling depending on the sample rate.
The digital filter cut off frequency is automatically set to half of the sample rate and the internal sampling frequency is up to 256 times higher than the output rate:

| Digital Filter (vs. Sample Rate)	0.1 … 51.2 kS/s	51.2 … 102.4 kS/s	102.4 … 204.8 kS/s
Bandwidth (-3 dB)	DC to 0.494 fs	DC to 0.49 fs	DC to 0.38 fs
Passband (-0.1 dB)	DC to 0.47 fs	DC to 0.45 fs	DC to 0.24 fs
Passband Ripple	-0.035 to +0.01 dB	-0.035 to +0.01 dB	-0.035 to +0.01 dB
Alias-free Bandwidth	DC to 0.42 fs	DC to 0.32 fs	DC to 0.22 fs
Alias Rejection	-95 dB	-92 dB	-97 dB
Delay through ADC	12 / fs	9 / fs	5 / fs
Oversampling	256	128	64

The filter characteristics of the digital ADC filter will also change automatically depending on the sample rate.
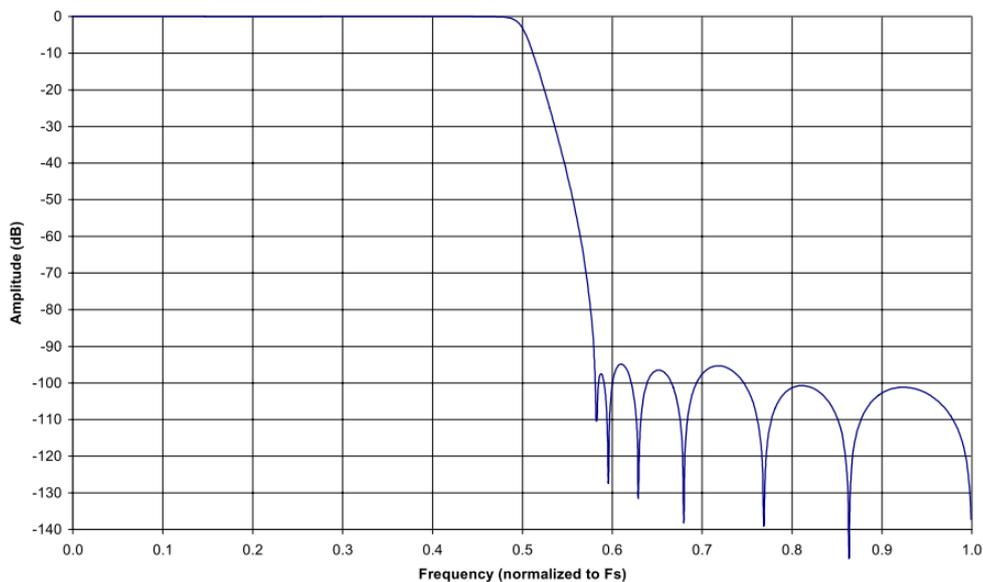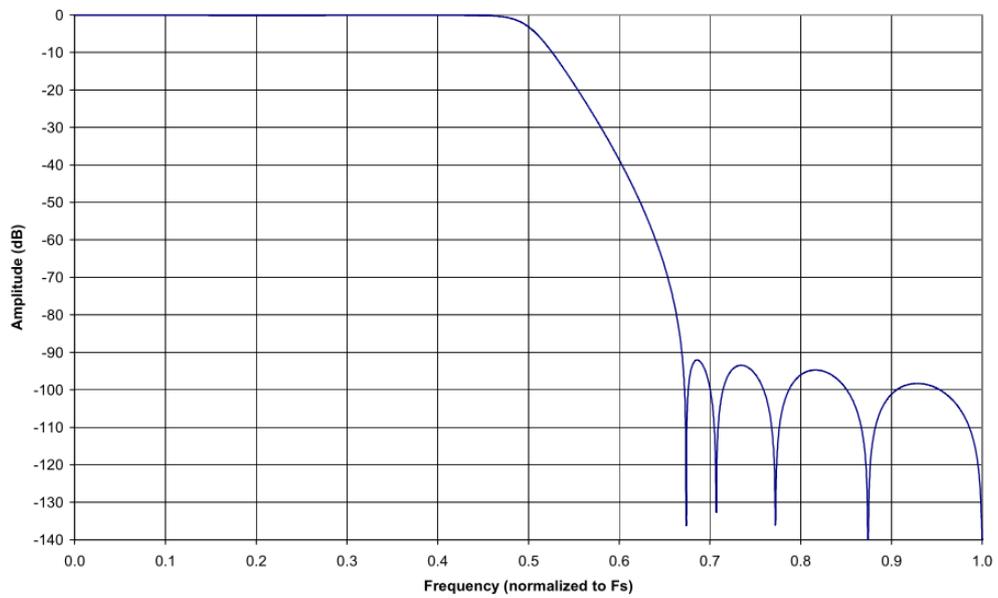

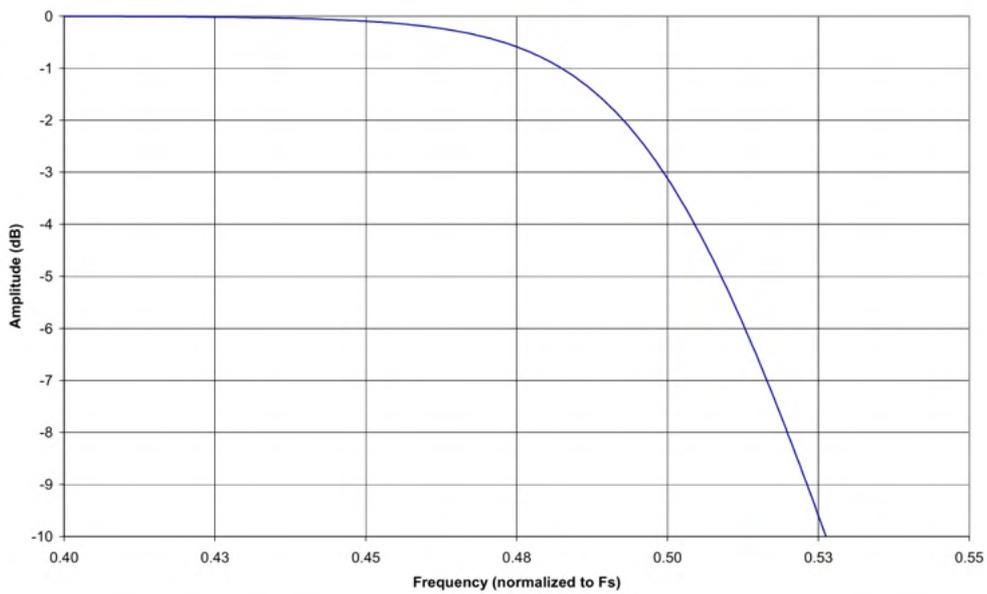*Sample rate 100 Hz to 51.2 kHz stopband rejection*
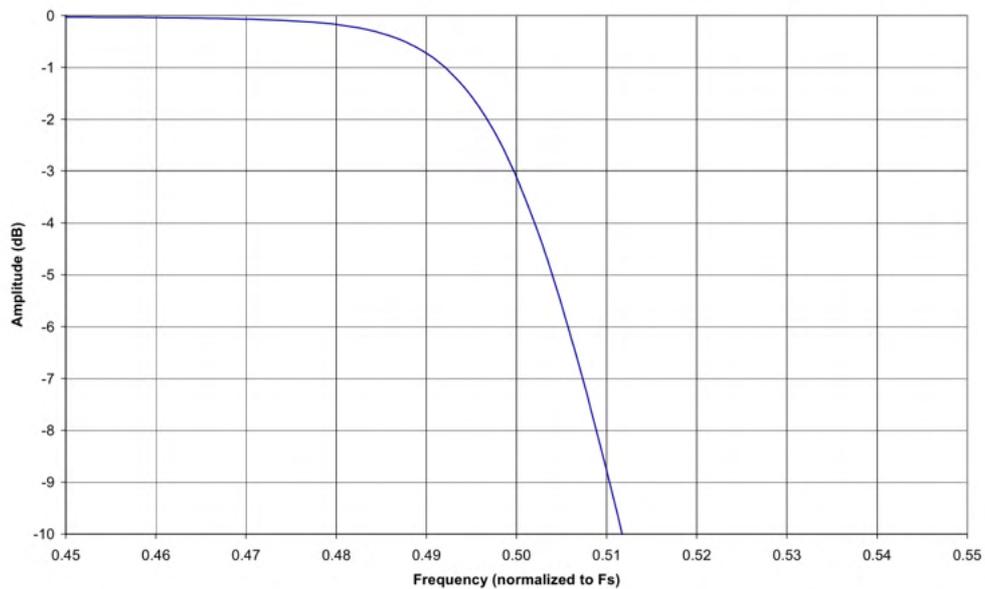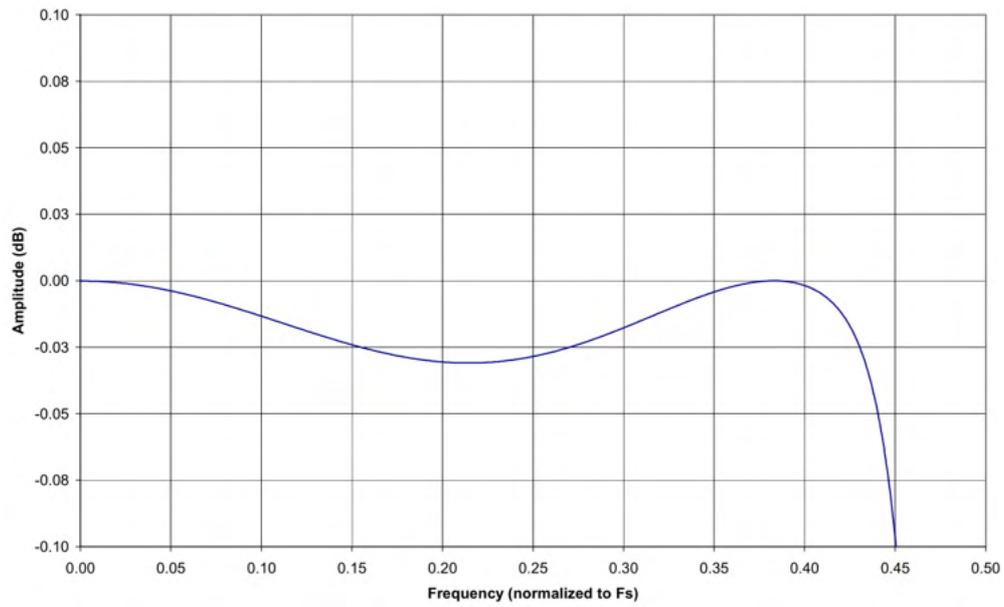
Sample rate 100 Hz to 51.2 kHz transition band detail
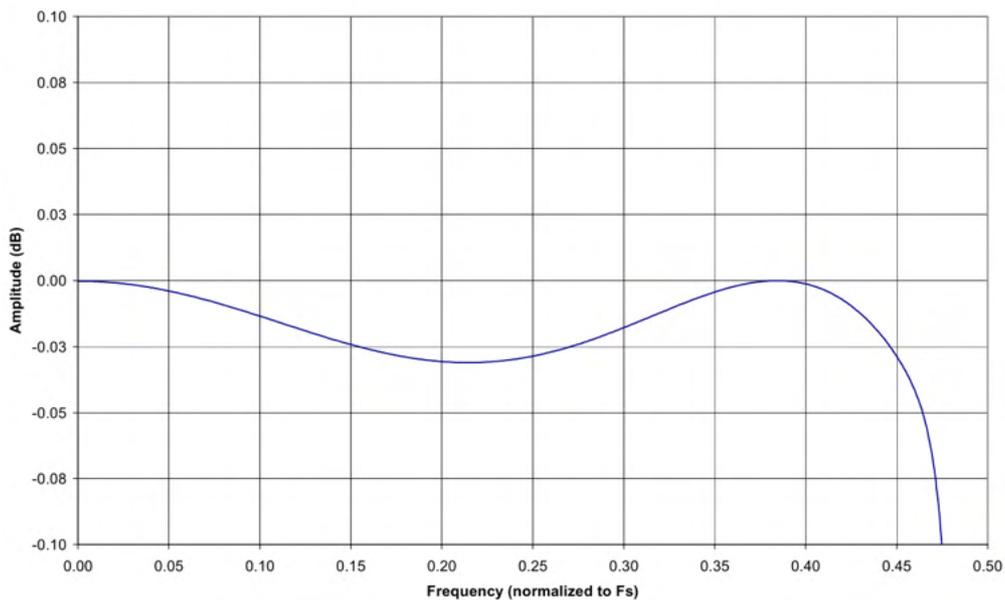
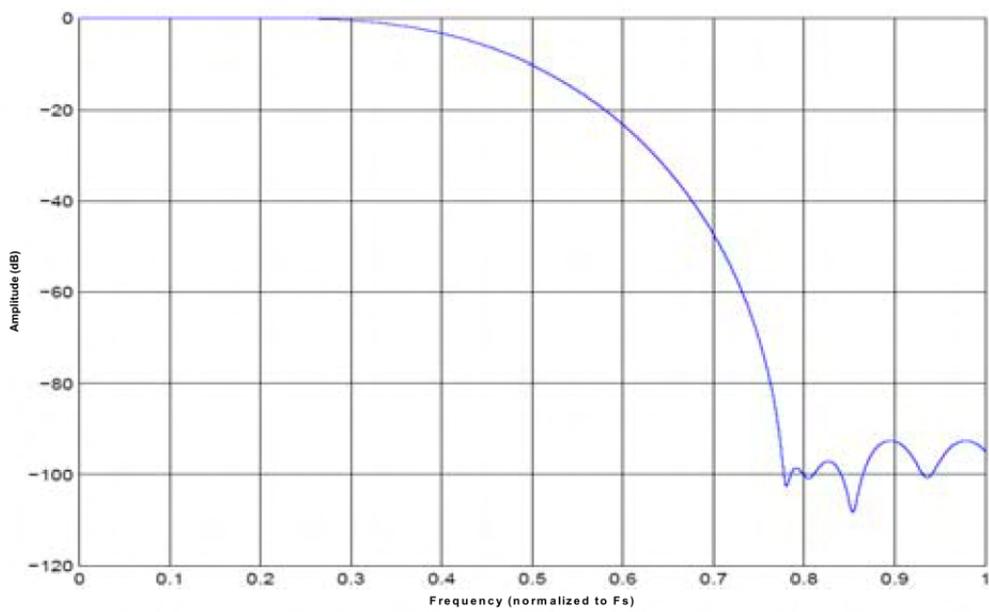*Sample rate 100 Hz to 51.2 kHz Passband ripple*

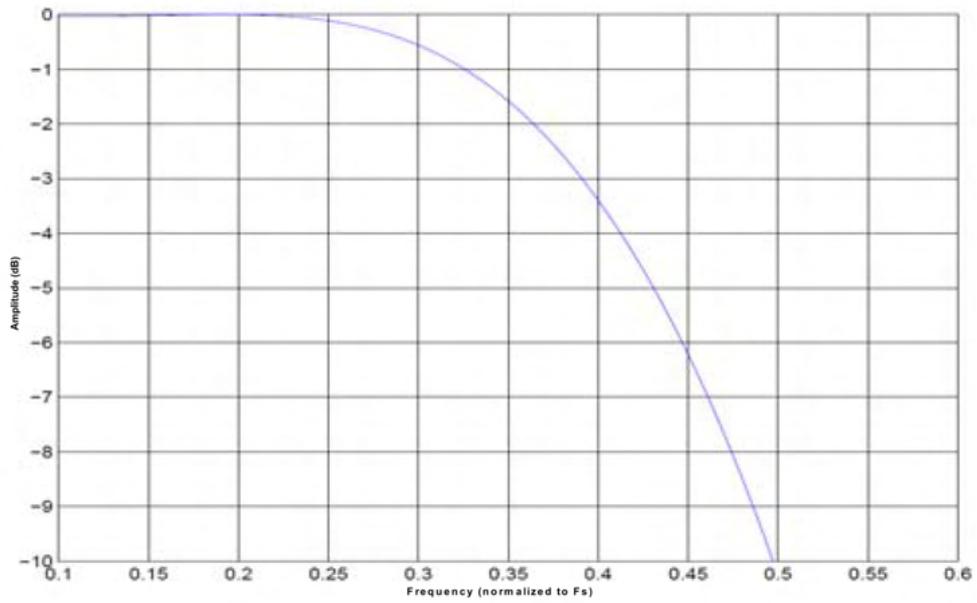*Sample rate 51.2 kHz to 102.4 kHz stopband rejection*

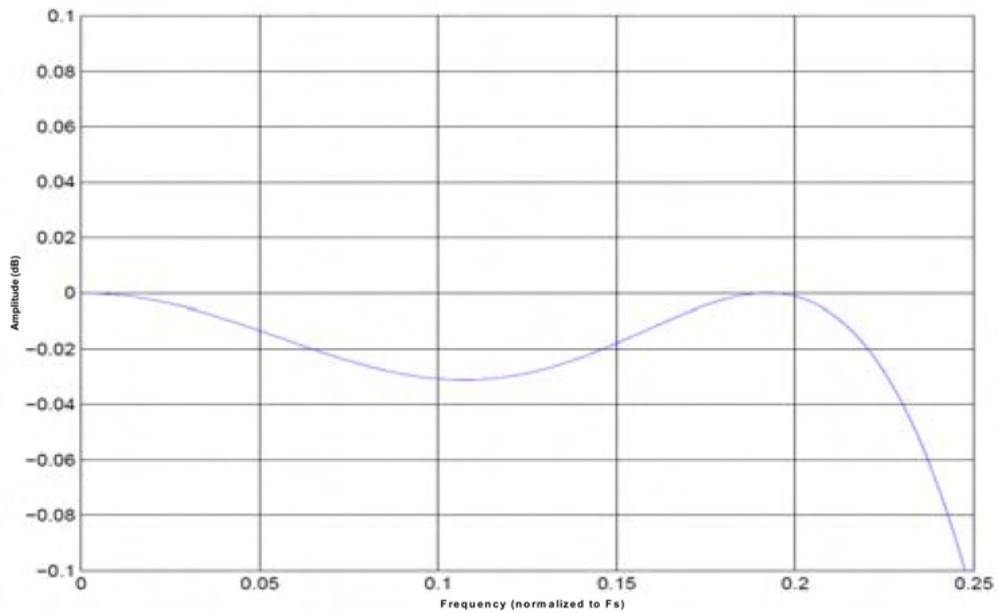*Sample rate 51.2 kHz to 102.4 kHz transition band detail*

Sample rate 51.2 kHz to 102.4 kHz Passband ripple

*Sample rate 102.4 kHz to 204.8 kHz stopband rejection*

Sample rate 102.4 kHz to 204.8 kHz transition band detail

Sample rate 102.4 kHz to 204.8 kHz Passband ripple

6.1.5.3. Overall alias free bandwidth

Alias Free analog measurement bandwidth or combined filter response from Analog filter and ADC filter response is again presented in illustration below "*Filtering components in SIRIUS® DualCore and HD modules*".

Input Amplifier

2nd order Low Pass filter 5 kHz / 100 kHz

Dual Core ΔΣ-ADC
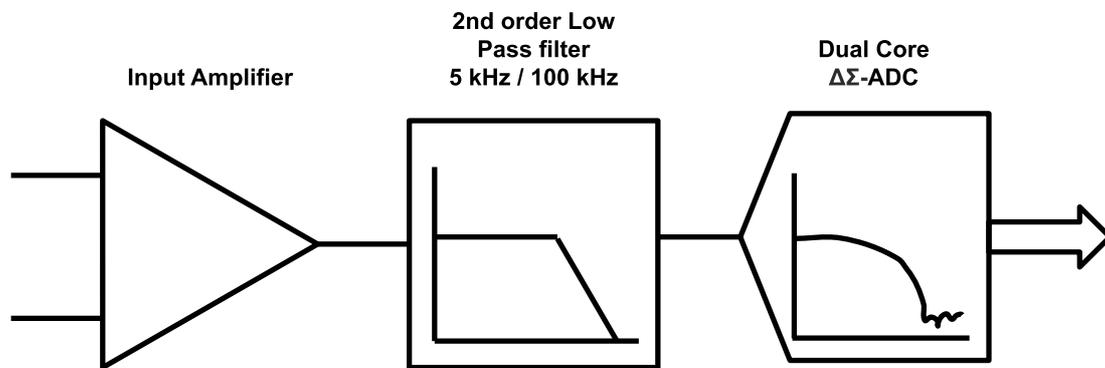
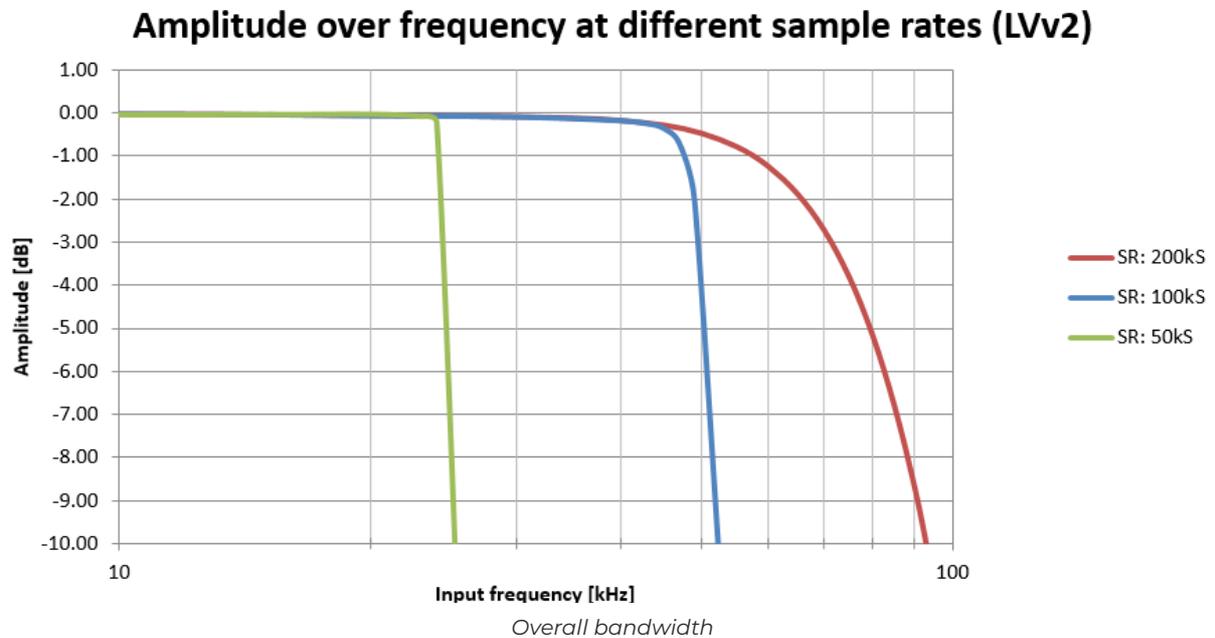*Filtering components in SIRIUS® DualCore and HD modules*

Important

Analog filter (-3 dB):
- 5 kHz up to 2 kS/s
- 100 kHz from 2 kS/s up to 204.8 kS/s

Digital filter (-3 dB):
- 0.494 fs up to 51.2 kS/s
- 0.49 fs from 51.2 kS/s up to 102.4 kS/s
- 0.38 fs from 102.4 kS/s up to 204.8 kS/s

Amplitude over frequency at different sample rates (LVv2)

Overall bandwidth

Example

Anti-aliasing filter (AAF)

Illustration below "*SIRIUS® Anti-Aliasing Filter*" shows an overview of the different filters and sampling rates in the frequency domain:

- The sample rate of SIRIUS is set to 2 kS/s.
- The analog aliasing filter is automatically set to 5 kHz (since the sampling rate is 2 kS/s) and guarantees free acquisition.
- The oversampling factor is automatically set to 256 (because the sampling rate is <50 kS/s) so that the internal sampling frequency of the Sigma-Delta ADC is 512 kS/s.
- Finally the digital FIR filter of the ADC is set to 1 kHz (half of the sampling rate).
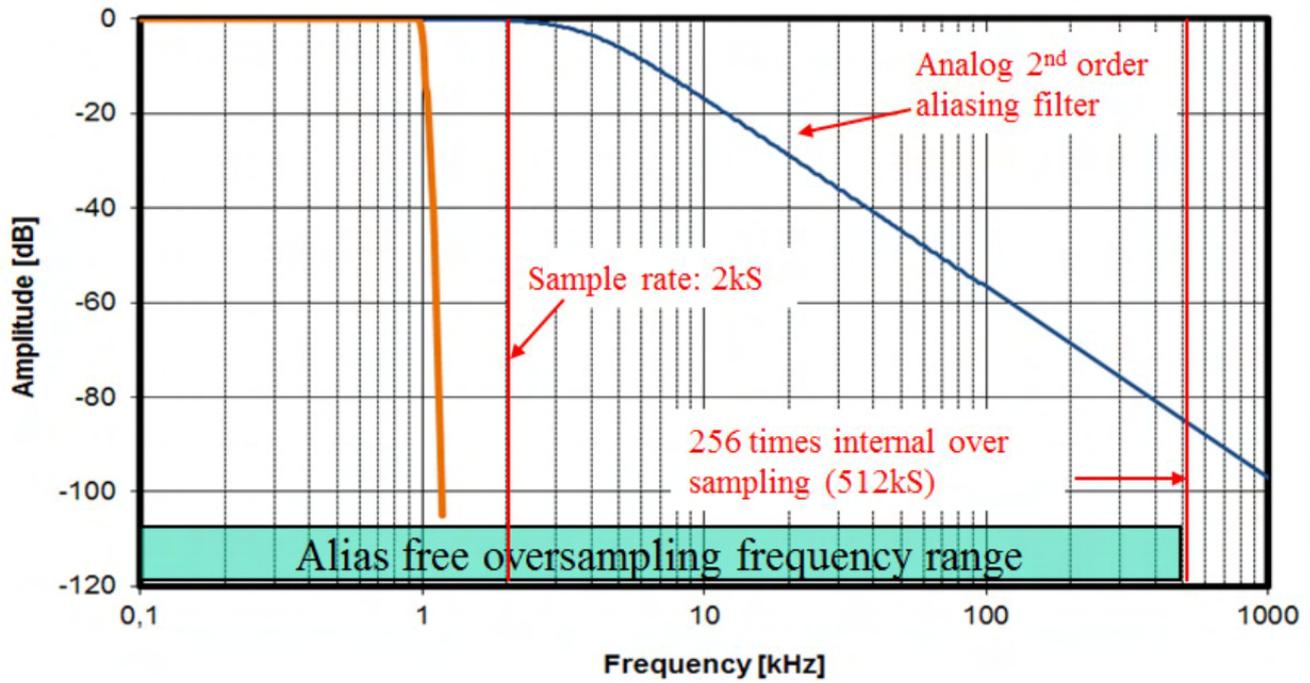
SIRIUS® Anti-Aliasing Filter

6.1.6. SIRIUS® High Speed: Anti-Aliasing

Sirius HS has a fast 1 MS/sec SAR type AD converter. That means that the ADC by itself doesn't filter the incoming signal, but acquires it »as is« at the time of sampling.

This is very useful in some cases where we want to have bandwidth of the signal as high as possible, for example when capturing transients, non sine wave (rectangular, triangular) signals, when acquiring voltage and current from frequency inverters and others.

Then the bandwidth must be as high as possible. With Dewesoft HS-HV and HS-LV the bandwidth of the amplifier is as high as 2 MHz, ACC module has 500 kHz …

Of course this kind of amplifier strategy also passes through higher harmonics, which in other cases (when we are interested in real frequency contents of the signal) doesn't work well. In such cases we need the strong anti-alias filtering of the signals. What makes it even more difficult is that each application requires different cutoff frequencies.

SIRIUS-HS can use 5 different filters which can be turned on or off:
- The first one is a 5th order Bessel analog hardware filter with cut-off frequency at 100 kHz, cutting off the high frequency content in the analog world before ADC conversion. When the filter is switched OFF, amplifiers will also acquire high frequency content.
- IIR filters between 40 and 1kHz are Firmware filters, which means that they are calculated on the FPGA. The filters can be selected from the drop-down list in the Low-pass filter options in Channel settings
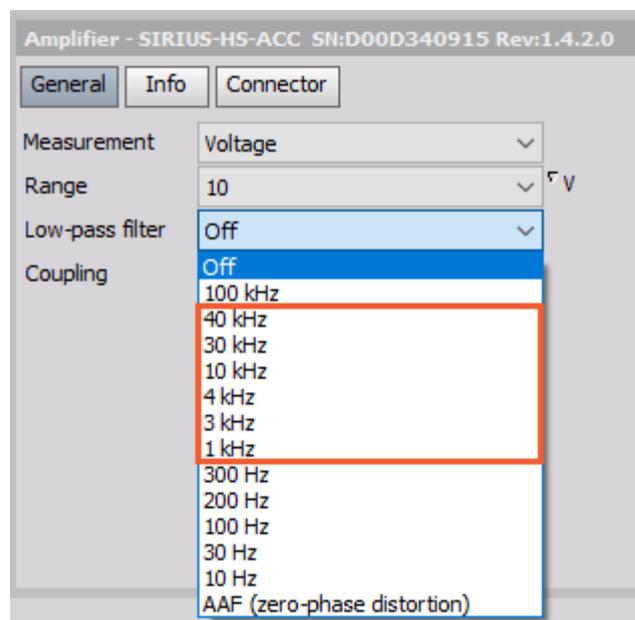

Firmware filters

- IIR filters with cut-off frequencies lower than 1 kHz are Software filters. If one of these filters is selected in the dropdown menu, then in addition to the software filter, with the selected cut-off frequency, a firmware filter with 1 kHz cut-off frequency is applied (the type and order of this filter is the same as the software one)
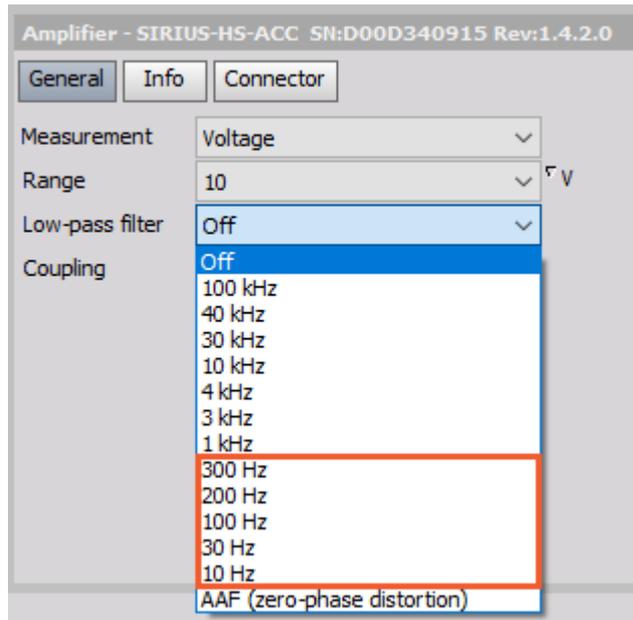
Software IIR filters

- AAF (zero-phase distortion - FIR filter) filter/decimator with the cutoff frequency dependent from sampling rate. The cut-off frequency of 80 kHz is set, if the channel sample rate is equal or above 160 kHz. When a lower sample rate is selected , then the cut-off frequency of the AAF is equal to half the sampling rate of that channel.
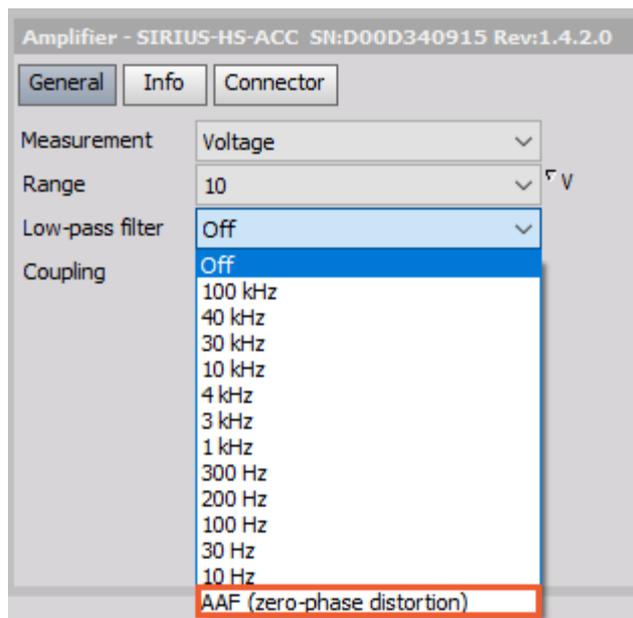

AAF (zero-phase distortion filter)

- Anti-aliasing filter - Software FIR filter can be enabled in the settings and can be applied over the already chosen SW or FPGA IIR filter that was selected from the drop-down menu in the Channel setup.

Enable alias free filtering on Sirius-HS
Enable alias free filtering on Sirius-HS when selecting manual IIR filters (e.g. 30kHz, 10kHz)   ⊘

Additional alias free filtering
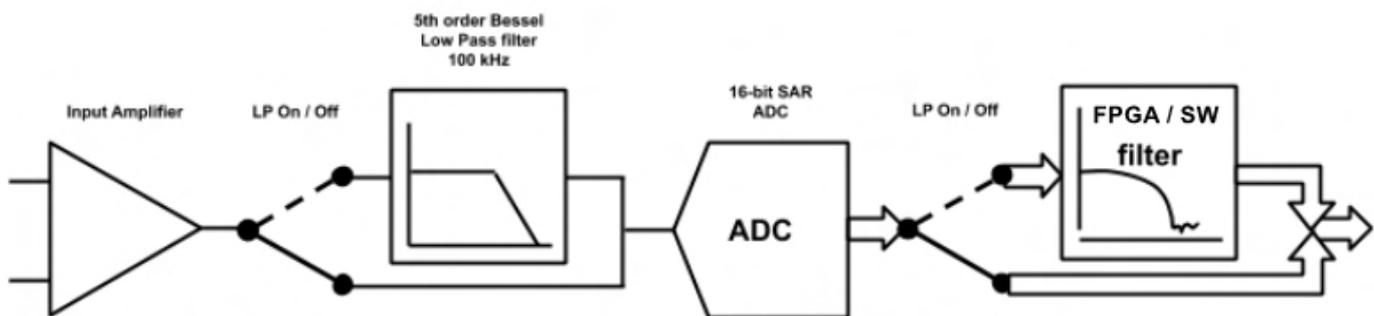
Filtering components in SIRIUS® HS modules

Hint

In addition to that the FPGA will downsample the data before sending it to software. Therefore Sirius is sampling data always with or close to the full speed, filter the data and downsample it, providing alias free acquisition with any sample rate.

Example

When sampling with 100 kHz measuring a signal with 10 Khz bandwidth. Sirius will still sample the data with 1 MHz, analog LP filter will attenuate all signal frequencies above 400 kHz for at least 60dB, making sure that below 100 kHz the data will be alias free. After that the digital filter will give the wanted bandwidth and in the last stage the data, already alias free, will be downsampled to 100 kHz.

Important

The FIR anti-aliasing filter was introduced in Dewesoft® X2 SP10. This filter has a very narrow, user defined transition band and has zero phase distortion in the pass-band region.
In Dewesoft X3® SP1 these anti-aliasing filters have been further updated, so that they are also active, when the sampling rate is above 100 kHz (this wasn't possible in the older versions of DewesoftX®) and can be active, when we are using any of the IIR software filters.
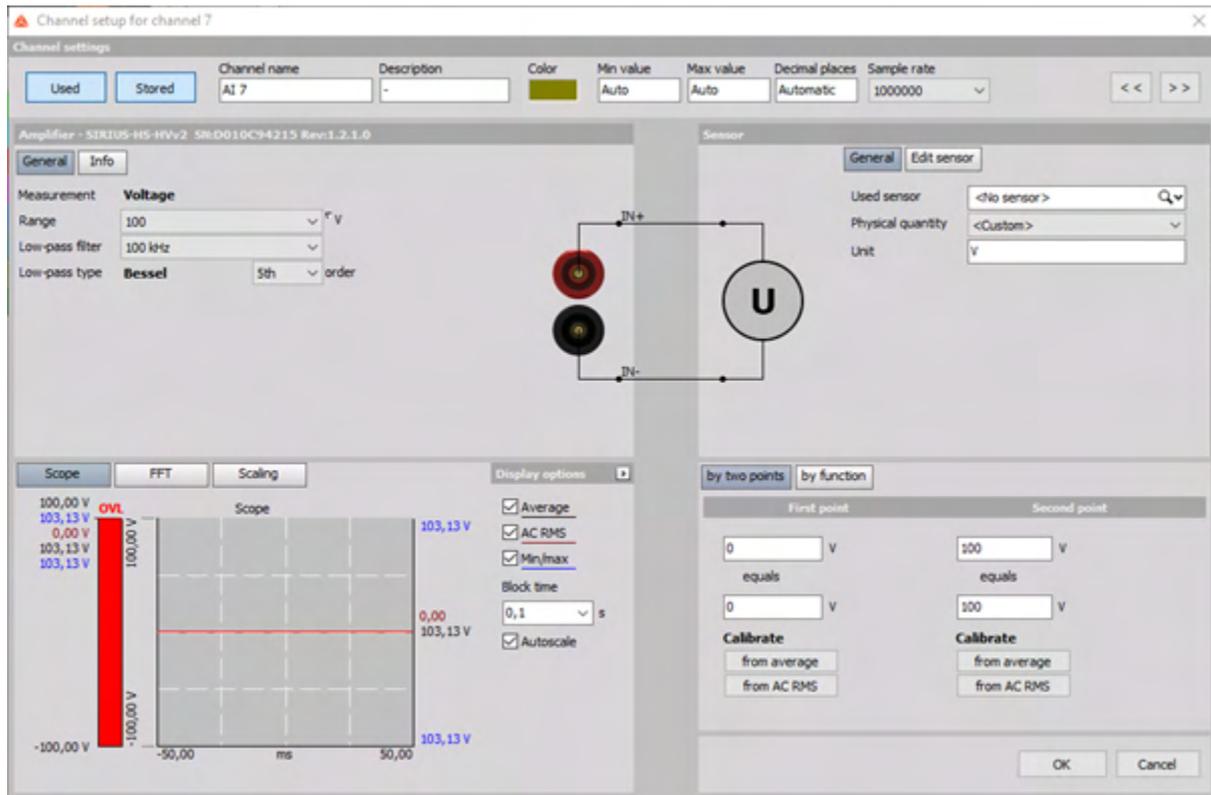
Illustration below "*Enabling the AAF when IIR filters are used*" shows the new advanced setting, which enables the anti-aliasing filters, when IIR filters are selected.
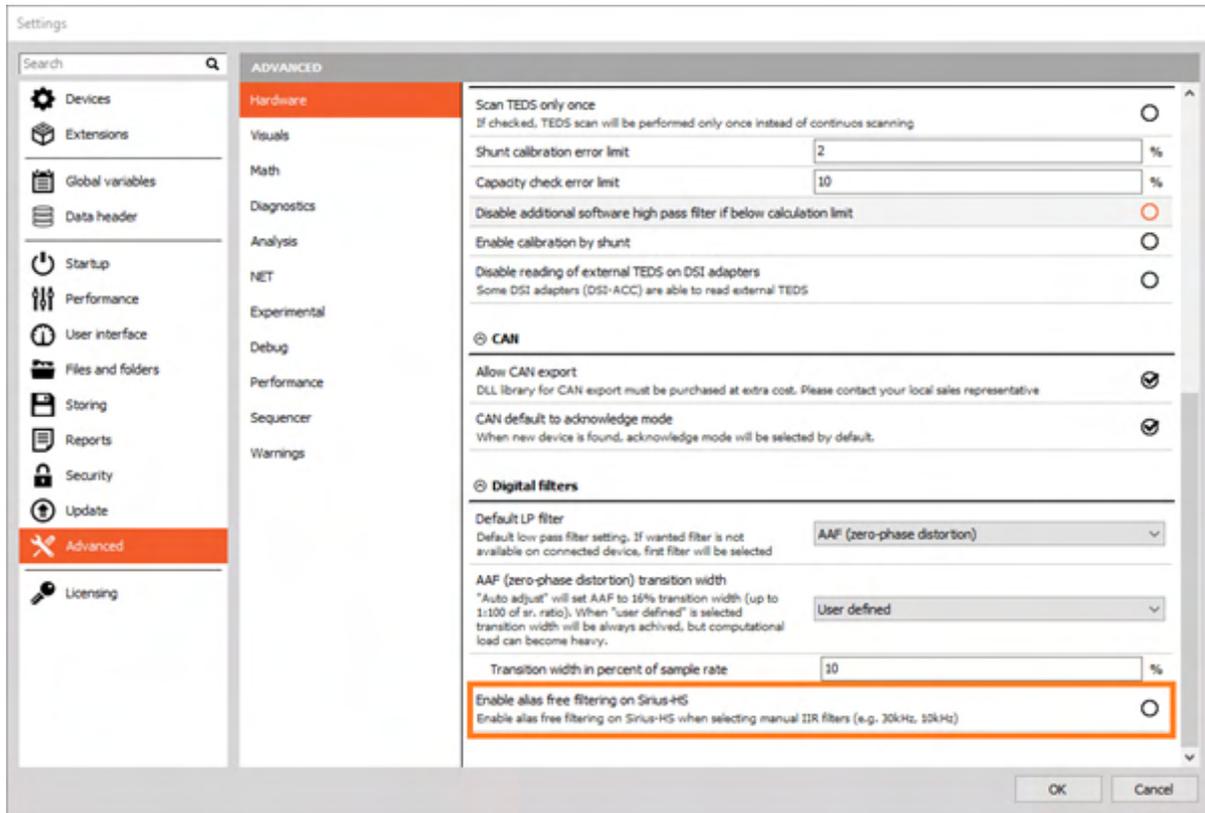
*Enabling the AAF when IIR filters are used*

6.1.6.1. Analog filter

The analog filter in the SIRIUS® HS modules is a 5th order low-pass Bessel prototype filter.

Setting up the 100 kHz filter

This filter's -3 dB point is at 100 kHz. This filter is always active, when any of the other filter options are used. We also have the option to enable the AAF filter in parallel to this one with the new hardware setting see illustration above "*Enabling the AAF when IIR filters are used*". Illustration below "*100 kHz filter characteristics with the "Enable alias free filtering on Sirius-HS" option turned on and off*" shows us a comparison of the filter characteristic, when this option is enabled and disabled (the sampling rate was set to 500 kHz).
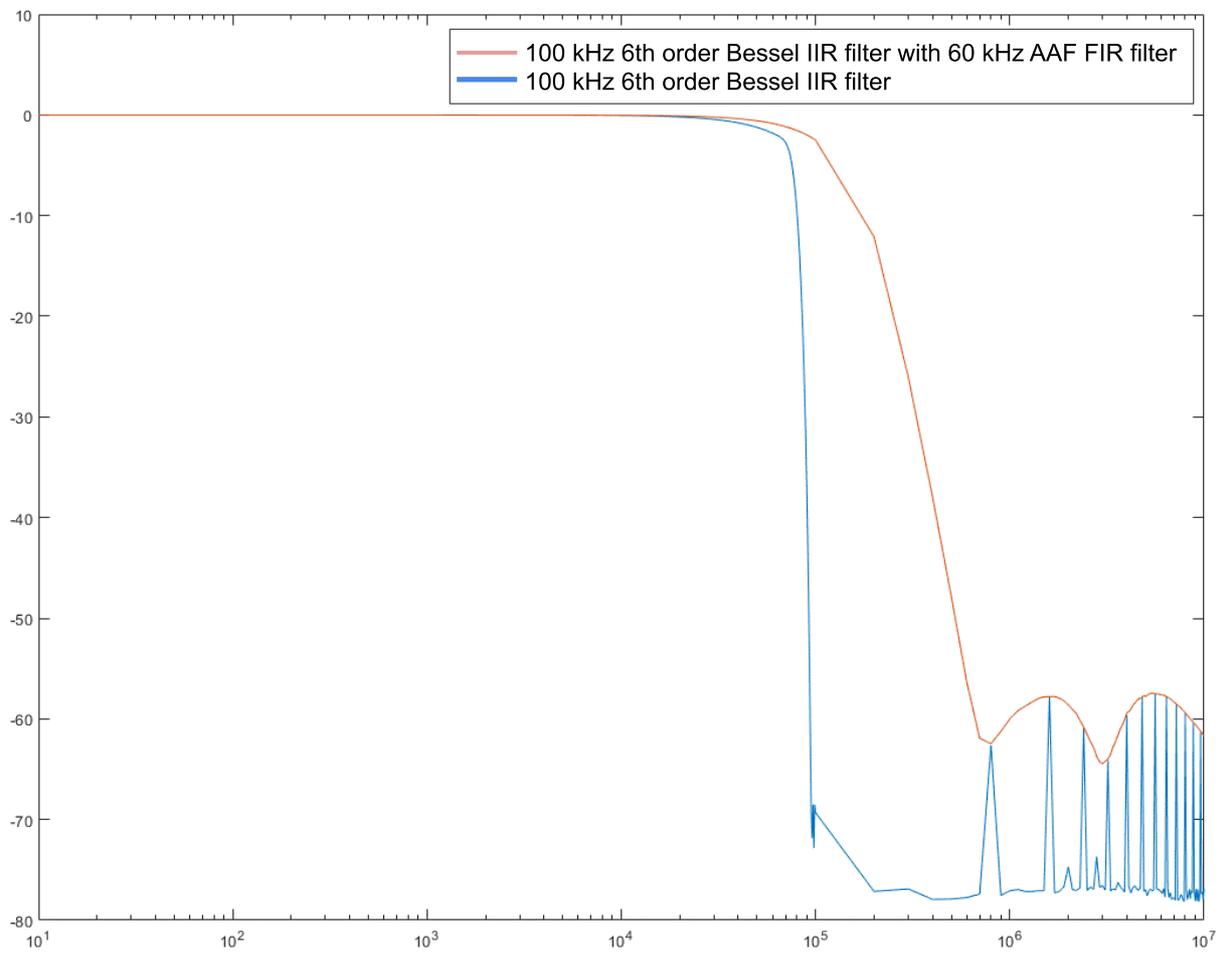
100 kHz filter characteristics with the "Enable alias free filtering on Sirius-HS" option turned on and off

6.1.6.2. AAF (zero-phase distortion)

To enable the AAF, open the channel setup of the channel we want to assign the filter to and under Low-pass filter select "AAF (zero-phase distortion)". See illustration below "*Selecting the Anti-aliasing filter*".
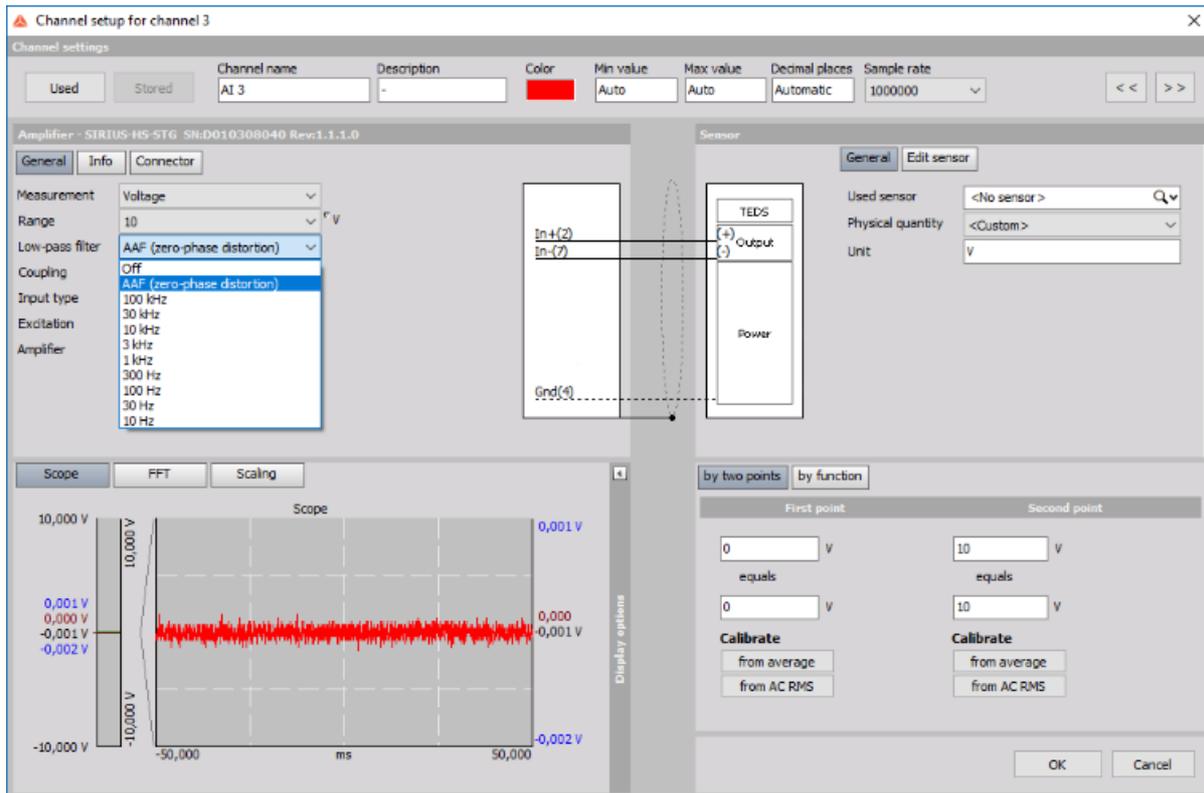

Selecting the Anti-aliasing filter

In Dewesoft X3 SP1 AAF filters have been updated, so that they can always be active, even if any other filters are selected from the drop-down list. It is also no longer needed to apply a sample rate divider to the channel, to get the filter to start working.

Important

If the sample rate of the channel that uses AAF is lower than 160 kHz, then FIR filters with cut-off frequency at half the sampling rate will be applied. In the case, when sample rate is higher than 160 kHz, FIR filters with 80 kHz cut-off frequency will always be applied.
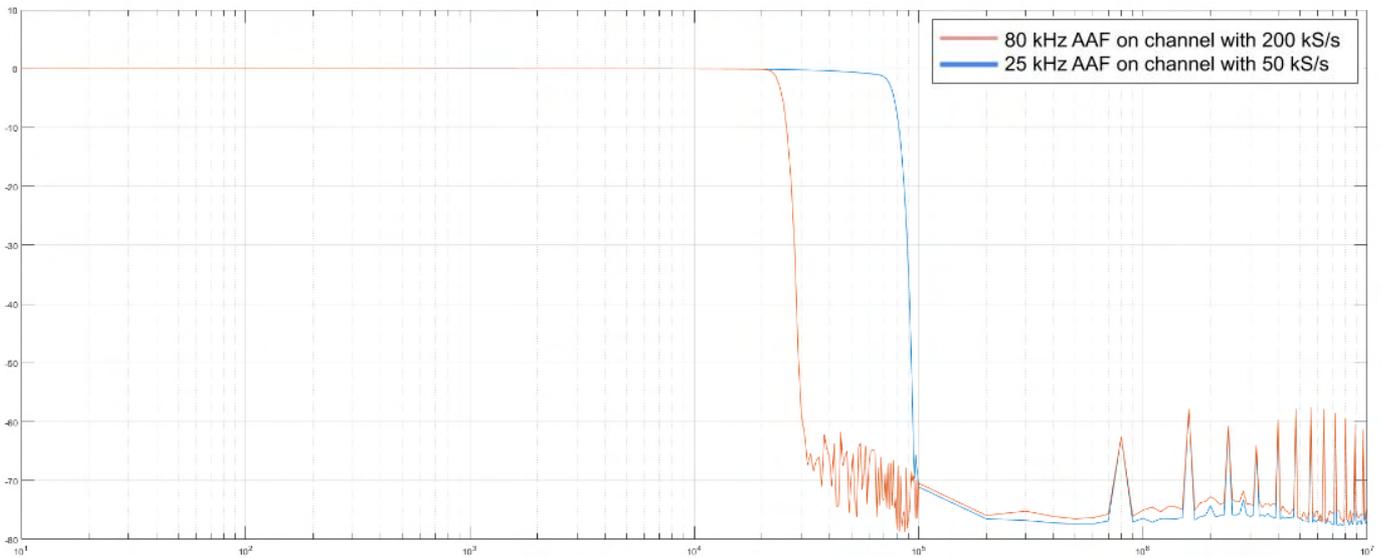
80 kHz and 25 kHz AAF

See illustration above "*80 kHz and 25 kHz AAF*" with measured characteristics of the FIR filters with sample rates set to 50 kHz and 200 kHz.

6.1.6.3. IIR filters

The last available filters are the IIR filters. In DewesoftX® on the SIRIUS-HS we can choose between 8 different filters with variable orders.
As with previous filters, an anti-aliasing filter with zero phase distortion can be added in tandem with this filter, if enabled in the advanced hardware settings.
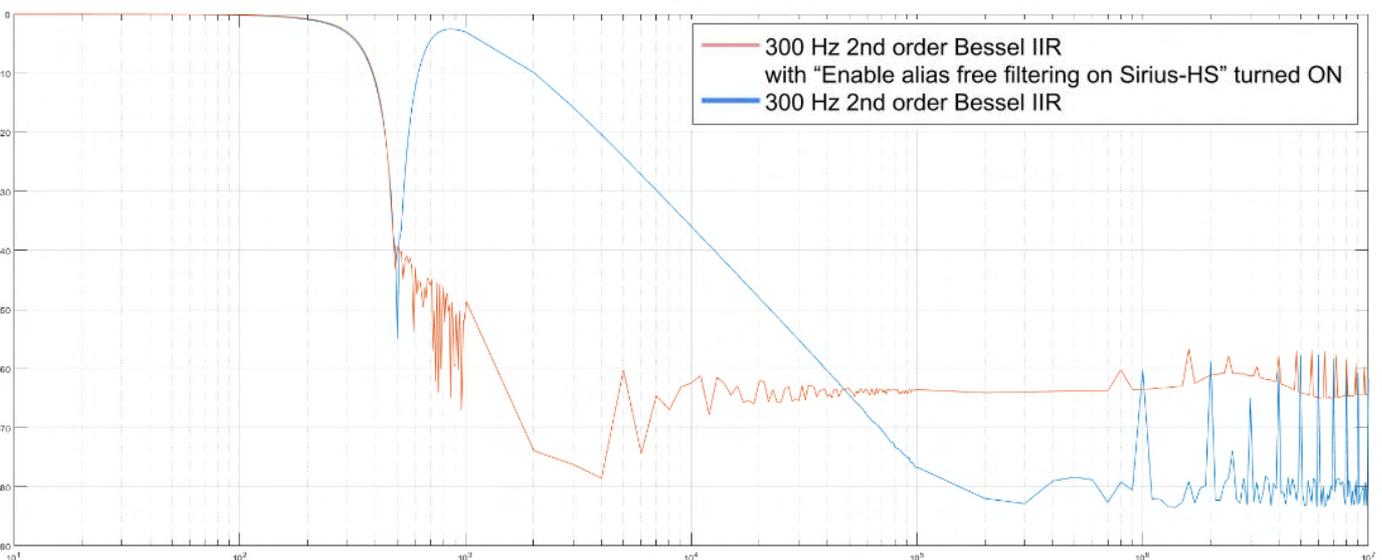
300 Hz Bessel IIR filters with the "Enable alias free filtering on Sirius-HS" option turned on and off

Example
Measurement of FIR filter

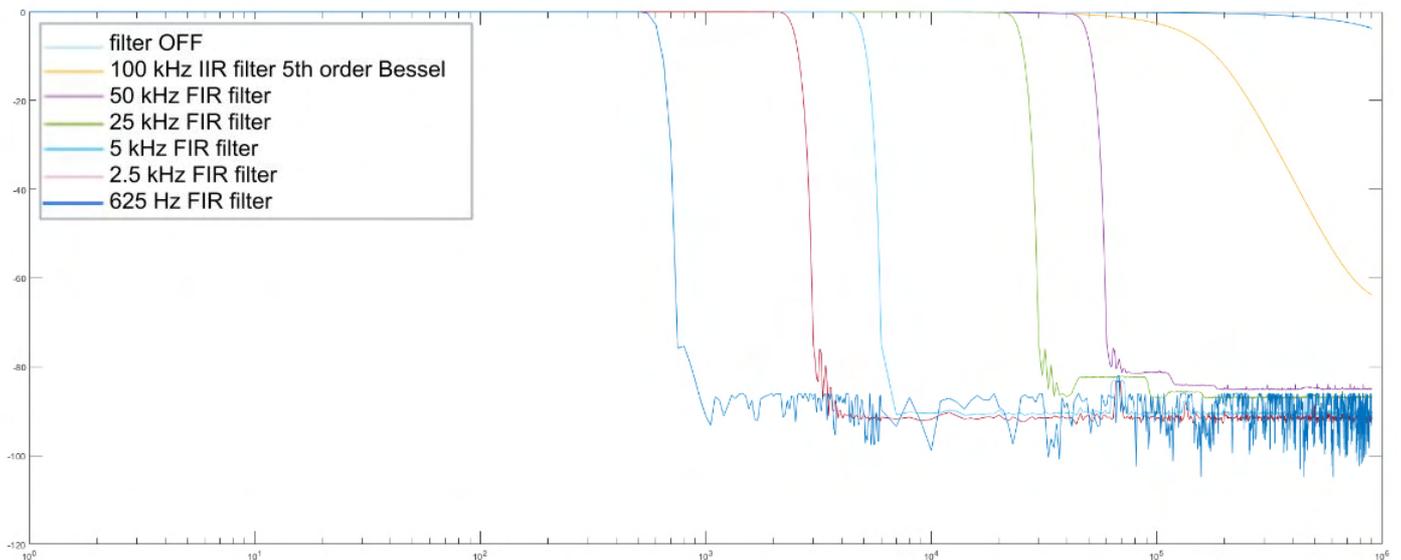Illustration below shows us an example channel setup, where the new AAF is used with different sample rates.

Example channel setup, channels with different SR

In the setup above the following filters were used on STG channels:
- Low pass filter off,
- 100 kHz 5th order Bessel IIR filter (Hardware filter),
- 100 kHz sample rate divider – AAF (zero-phase distortion) with fc of 50 kHz,
- 50 kHz sample rate divider – AAF (zero-phase distortion) with fc of 25 kHz,
- 10 kHz sample rate divider – AAF (zero-phase distortion) with fc of 5 kHz,
- 5 kHz sample rate divider – AAF (zero-phase distortion) with fc of 2.5 kHz,
- 1250 Hz sample rate divider – AAF (zero-phase distortion) with fc of 625 Hz.

With this setup characteristic of each filter was measured. Illustration below shows the result of this measurement.

Measurement results of FIR filters and 100 kHz hardware filter

Illustration below "*Example channel setup*" shows an example of an updated version of the AAF used in a setup. Main sampling frequency is no longer 1 MHz, filters are enabled automatically, sample rate dividers are no longer required.

Example channel setup in X3

6.1.6.4. FIR filter characteristics

A low-pass filter is defined by 5 characteristics (see illustration below "*FIR filter specifications*"): passband ripple, stopband ripple, cutoff frequency, pass band frequency and stop band frequency. In DewesoftX® we are able to manipulate 3 of these characteristics. With the divided sample rate we select the cutoff frequency which is equal to half of the channel sample rate.
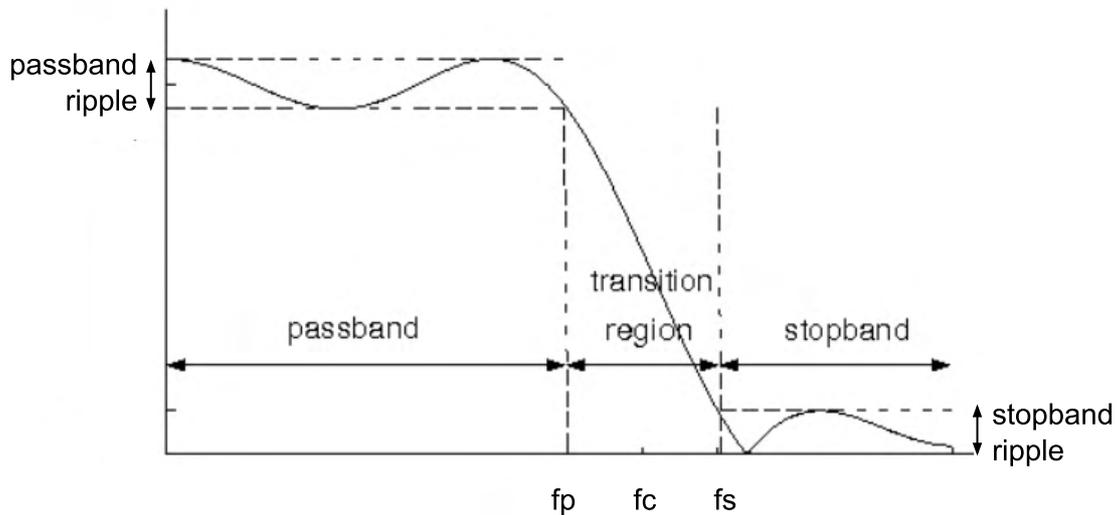
FIR filter specifications

The other characteristic that we can set is the transition width. This value is by default set to 16 %. This means that the stop band and pass band frequencies (fp and fs respectively) are equal to ±16 % of the cutoff frequency (fp = 34 % fc, fs = 66 % fc). Transition width is defined in the advanced hardware settings under digital filters (see illustration below "*Digital filters, AAF (zero-phase distortion) transition width*").

Important

Smaller transition width requires more processing power!
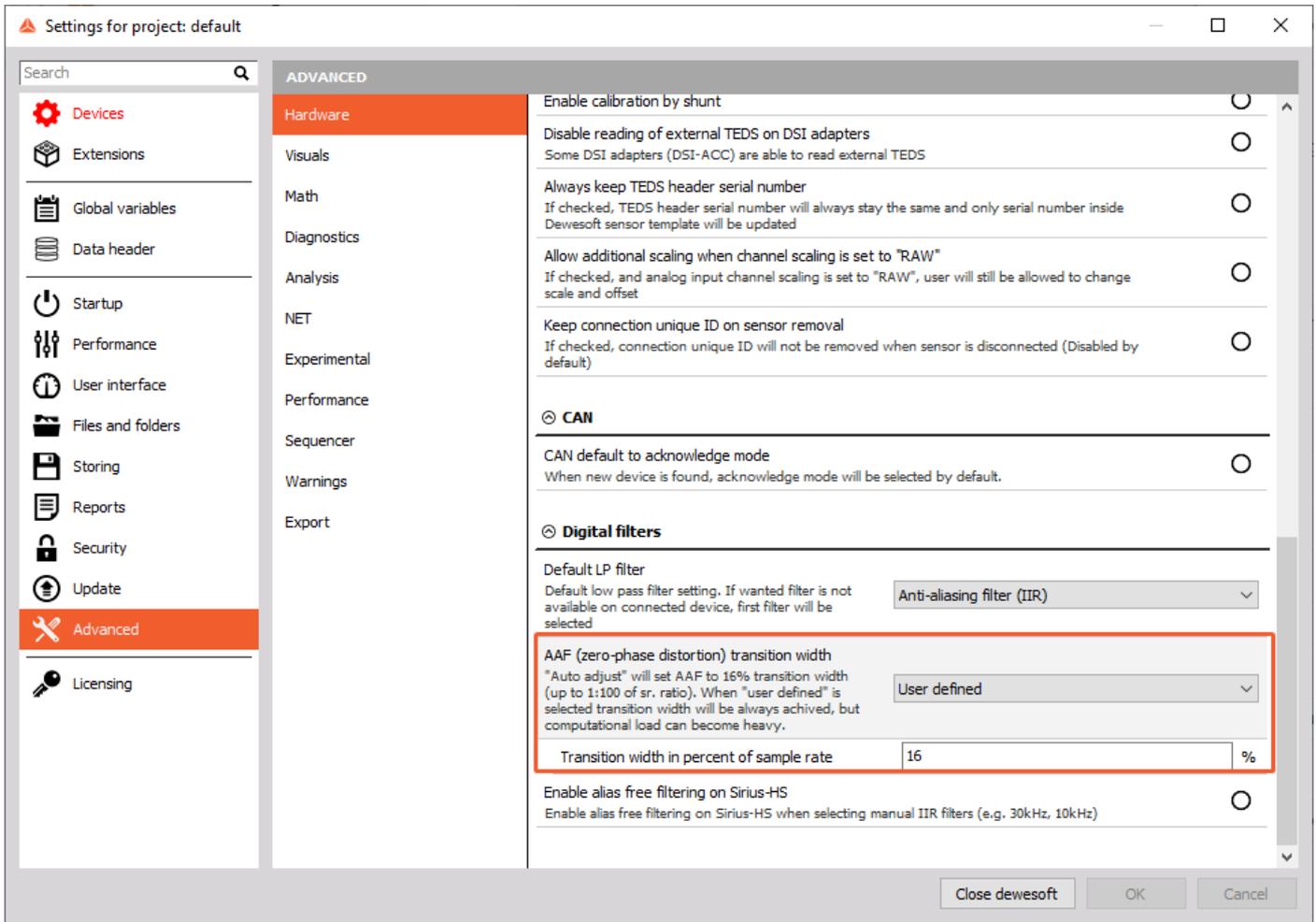
Digital filters, AAF (zero-phase distortion) transition width

6.1.7. DewesoftX®: Custom low pass filter settings

The filtering described in the previous chapters is done in the SIRIUS® measurement hardware: it assures that the data that SIRIUS® passes to the DewesoftX® software is aliasing free. But you must be careful not to introduce aliasing again in software.

Example

One way that this can easily happen, is when you set a custom sampling rate on a single channel in the analog channel setup:
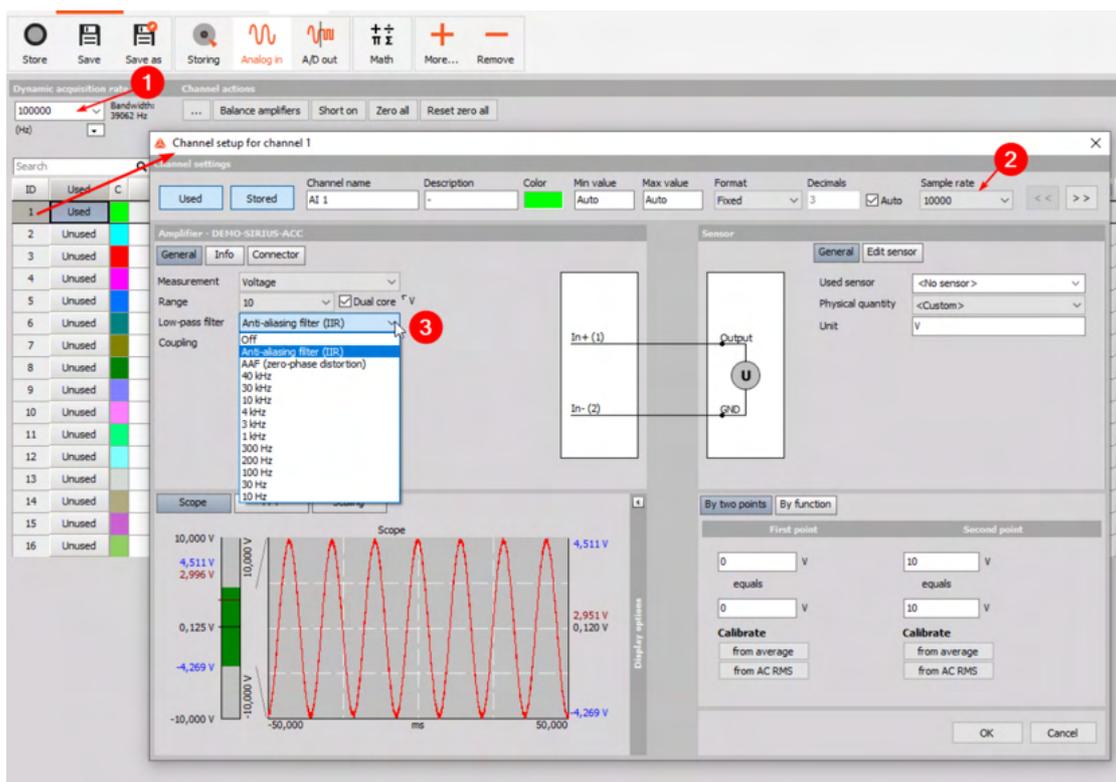
Analog Channel Setup – custom sample rate

In the example above you can see that the dynamic acquisition rate ❶ is set to 100 kHz. The sample rate of the first analog input channel (AI 1) is set to only 10 kHz ❷. This means that the SIRIUS® hardware will send the measurement data of all channels at a rate of 100 kHz via USB to DewesoftX® and DewesoftX® will then reduce the data for channel AI 1 to 10 kHz.

This reduction could be done by simply using only every 10th input sample that we get from SIRIUS® (and thus skipping 9 out of 10 samples): we already know from the previous chapters that this will introduce aliasing!

Hint

DewesoftX® provides a convenient way to select how to tackle this problem: the custom Low-pass filter setting (**3** in image above "Analog Channel Setup – custom sample rate") in the analog channel setup:

- OFF: when you deactivate the Low-pass filter, the samples are skipped as described above and you will experience aliasing effects.
- Alias free: this setting will automatically adjust the low-pass filter frequency, so that your measurement data is always aliasing free. Details: DewesoftX® will automatically set the filter-frequency to 0.4 of the reduced rate and use a Bessel filter of 8th order Note: when you do not set a custom sampling rate for the channel (i.e. **1** and **2** are the same in image above "Analog Channel Setup – custom sample rate"), then no filtering is required. Thus Alias free is the same as OFF in this case.
- Custom frequency (e.g. 100 Hz, 300 Hz, 1 kHz, …): will set the filter frequency accordingly.

Important

The custom low-pass filter is an IIR filter, so it will introduce a phase shift – similar to an analog filter. Using a FIR filter for many channels is often not possible, because it requires considerably higher computation power (which cannot be provided by current general purpose CPUs). Note: if you want to use a FIR filter for your channel/s anyway, then you can disable the custom filter (set it to OFF) and add FIR filter Math-channels instead.

7. Accessories

Optional SIRIUS® Accessories and Sensors (e.g. DSI®-adapters, Battery Packs, Current Clamps, etc.) can be found in a separate document, which is available for download from our homepage: http://www.dewesoft.com/download.

In the HW Manuals section click the download link for the Manual for Dewesoft Accessories and Sensors.

8. Advanced Topics

The topics in this chapter are optional and only recommended for advanced users or Dewesoft staff.

8.1. Wireless connection

This topic will show how to establish a wireless connection between an SBOX running Windows 7 Professional and a Samsung Galaxy Tab 2 running Android 4.x.

8.1.1. Prerequisites

We assume that the Windows 7 PC has DewesoftX® and the DewesoftX®-NET option installed. Note: you do not need to activate the DewesoftX®-NET option in DewesoftX® (and thus you also don't need to buy a valid license for the DewesoftX®-NET option) – in this example we just need the installation of the Ultra VNC server (which is automatically done when the DewesoftX®-NET option is being installed).

Hint
The procedure is prepared and tested only for the Dewesoft SBOX – it may not work on other PC's: It will only work on Windows 7 (e.g. Windows XP does not support Hosted WLAN) User access control should be disabled Not all WLAN drivers support Hosted WLAN

Detailed information about the Hosted Network feature of Windows 7 can be found here: http://msdn.microsoft.com/en-us/library/dd815243%28VS.85%29.aspx

8.1.2. Hosted network on Windows 7

The hosted network feature of Windows 7 creates a software-based wireless access point (AP) (sometimes referred to as a SoftAP) that uses a designated virtual wireless adapter. This allows the Windows 7 PC to create a wireless network that other devices can connect to.

We have prepared some scripts that will handle all the setup work – you will find the scripts in the Extras\LAN_HostedNetwork folder of your SIRIUS® installation USB stick. The folder contains 3 script files – you just need to start the script ApplyHostedNetwork.bat as Administrator: See image below "Run as administrator". First, hold down the SHIFT key and right-click the script ApplyHostedNetwork.bat. Then select Run as administrator from the pop-up menu.
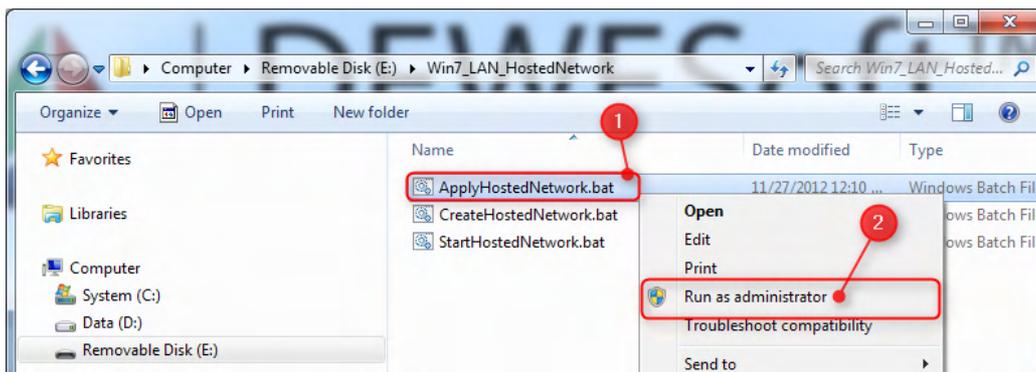
Run as administrator

1. Read the notes and press any key to continue
2. Enter the SSID of the hosted network: you will see the SSID in the list of available networks on your tablet
3. Enter a password to access the network.

For this demonstration we use a simple password – you should use a more secure one (maybe with Caps, numbers and even special characters) When the script is done, everything is correctly configured and set-up, you should already see our SBOX network in the Network list of the SBOX (See image below "Script").
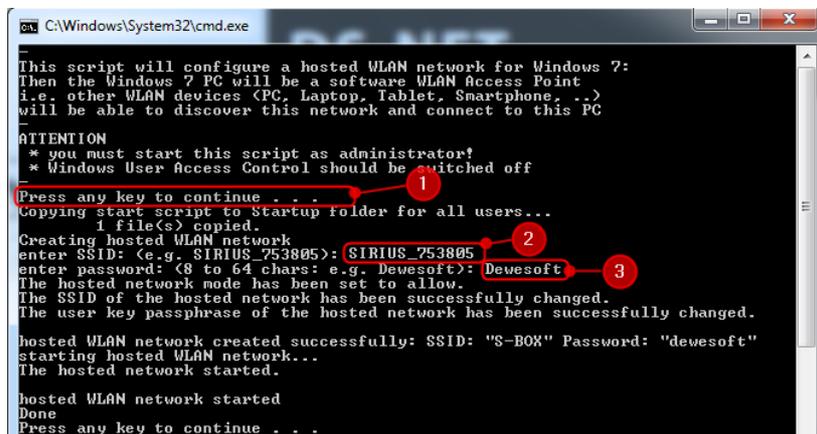
Script

During the execution the script StartHostedNetwork.bat has been copied to the Startup folder of all Windows users (See image below "Network") so when you restart your PC and log on for the next time,

the hosted network will be started automatically – during a short time, you will see the Windows command shell.

Network
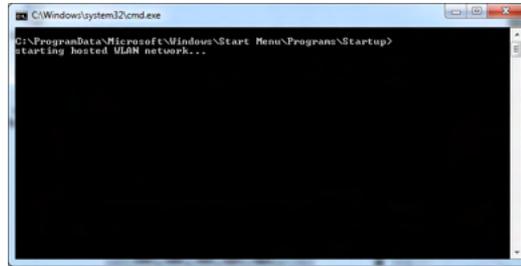
Automatically started file
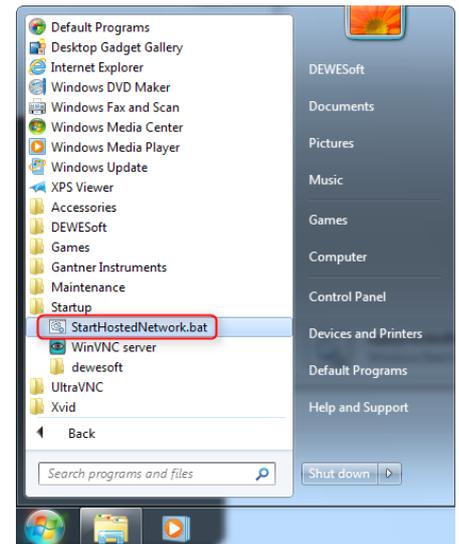
Startup

Hint

If you ever want to deactivate the Hosted Network, just delete the StartHostedNetwork.bat script from the Startup folder and restart your PC.

8.1.3. Android: WiFi connection

In the list of available Wi-Fi networks of your Android tablet, you will already see the hosted WLAN network.
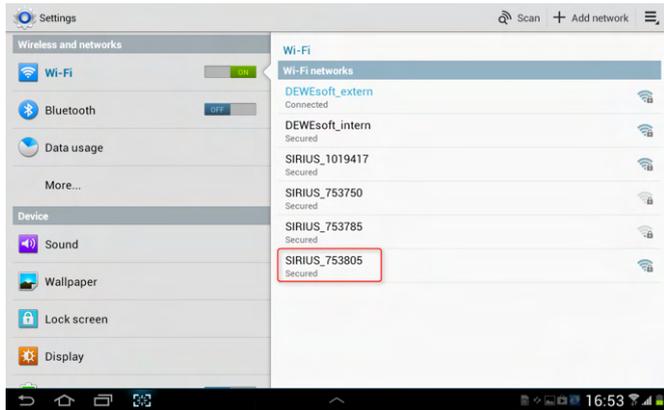
Android Wi-Fi network list

That's it. The WLAN network in the Wi-Fi list of your Android device should now show Connected.

Click on our network (SIRIUS_753805) to open the connection dialogue, enter the password Dewesoft and click Connect.

Android Wi-Fi connect
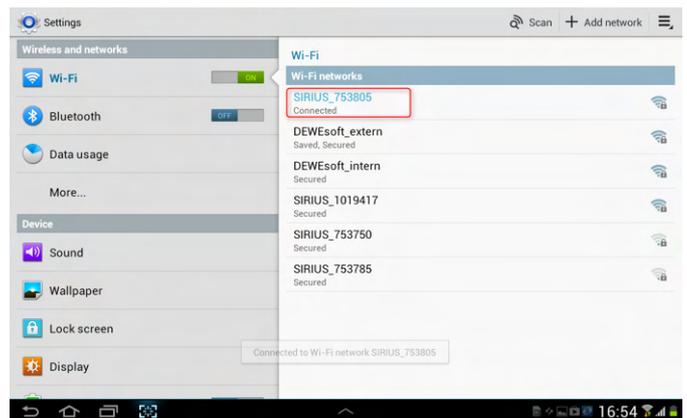
Android Wi-Fi connected

8.1.4. Android: VNC

Next, we need a program to connect to the VNC server on the SBOX. There are many different VNC programs available in the Google Play Store. For this demonstration we will use the free program Jump Desktop Free (for detailed description and help see: http://jumpdesktop.com/).

First, install the Jump Desktop Free program on your tablet via the Google Play Store.
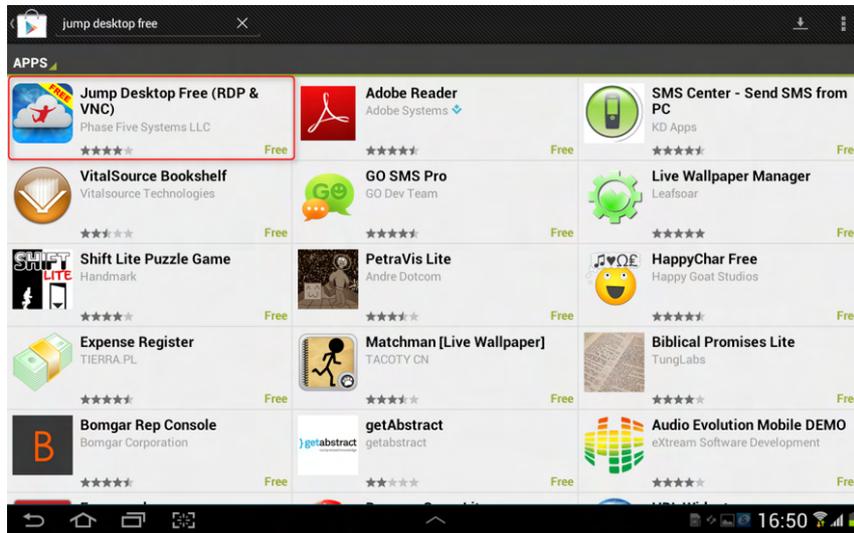
Google Play Store

After the installation is complete, just click on the Jump icon on your desktop to start the VNC program:

Jump icon

Select the setup type Manual Setup:
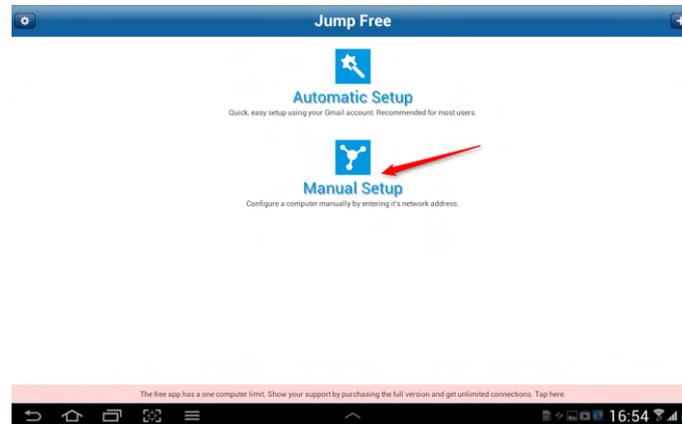
Setup type

In the Add Connection dialogue enter the IP-address 192.168.173.1 (this is the default IP address of the hosted WLAN network that we have created on the SBOX) and select VNC as Connection Type. Then click the Save button.
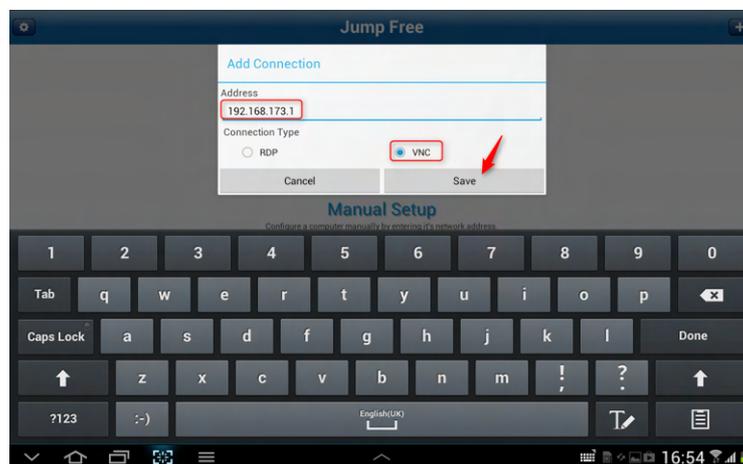
Add connection

Next, you will see all settings of the connection. You can change the Display Name if you like. Click the Back button to get back to the Connection List:
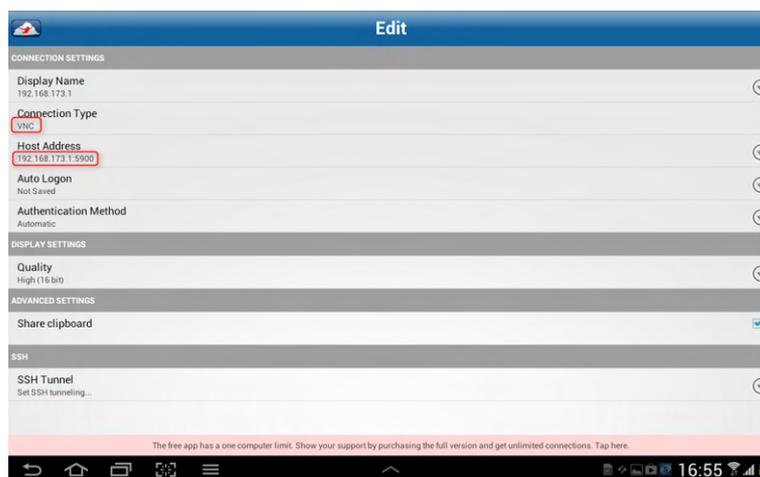
Connection settings

In the connection list you can click anywhere in the area to open the connection – or click on the wrench symbol to change the settings of the connection. Note: the free version of the Jump Desktop software only supports one connection.
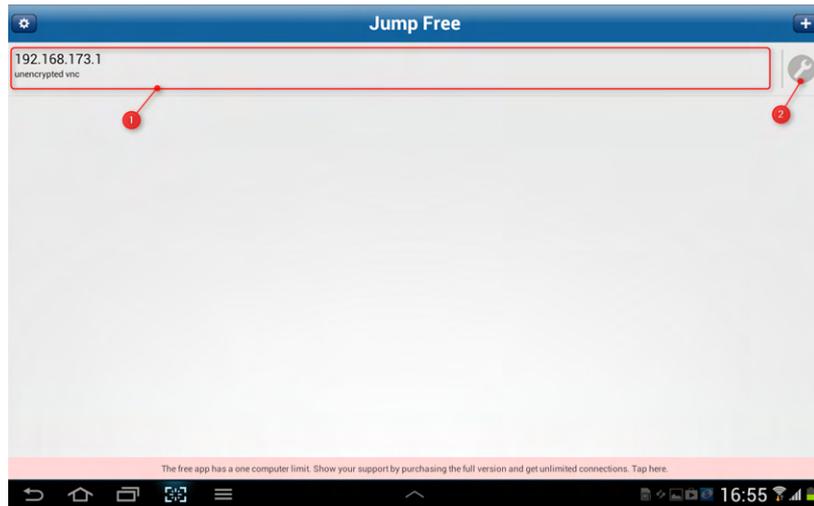
Connection list

When you open the connection, the program will connect to the Ultra VNC server running on the SBOX. When you do this for the first time, you must enter the password for the VNC server. The default password of the DewesoftX® VNC instance is the small letter a. Enter the password and click Login.
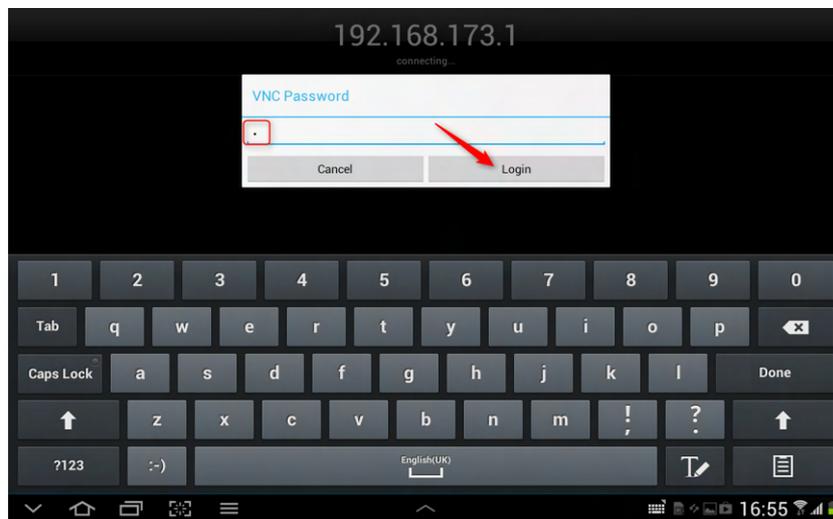
VNC password

You will immediately see the screen of the SBOX and you have complete control over the SBOX. You can use the mouse, enter text and use all special keys via the Jump Desktop program
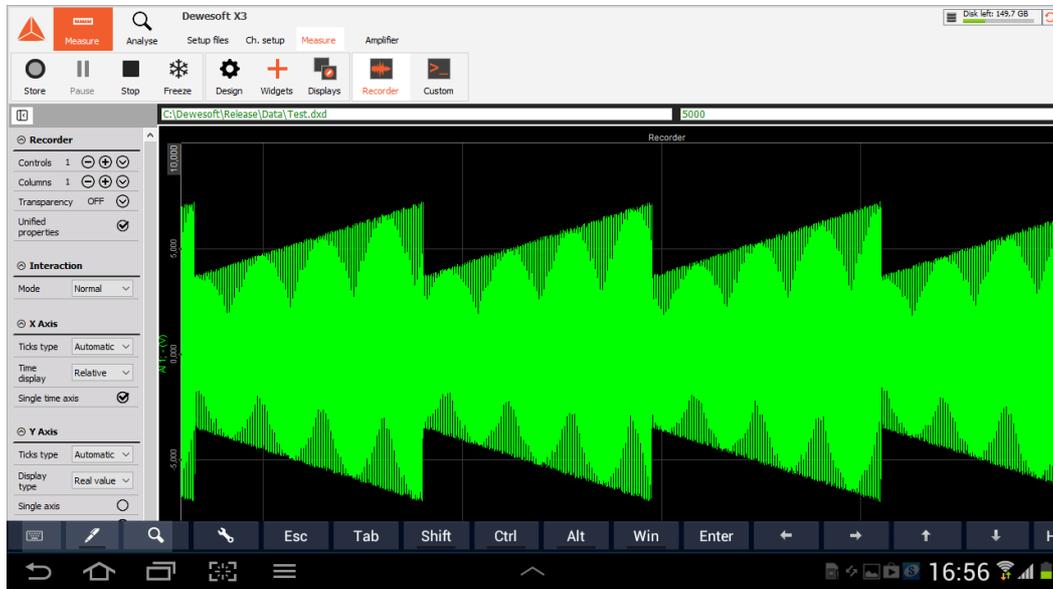
Active VNC connection

Mouse action	Finger guesture
Click	Tap the screen
Double click	Double tap the screen
Right click	Long tap the screen
Left mouse drag	Long tap or two finger tap
Scroll Wheel	2 quick taps and drag(don't lift your finger up after the 2nd tap - like on a trackpad)
Zoom	Two finger vertical swipe (up or down)
Quickly show or hide keyboard	Three finger tap

8.2. Synchronisation

When acquiring data from multiple measurement channels, the degree to which the data of the different channels can be correlated to each other in time can be very important. If the data of the different channels is not synchronised, your analysis may be inaccurate or even completely wrong. The faster you acquire the data, the more important synchronisation becomes (e.g. when you only acquire one data point for a temperature measurement per minute for a relatively short measurement period, synchronisation to other measurement channels may be irrelevant).

Since this is such an important point, DewesoftX® offers you a wide range of possible ways to synchronise your data. To understand all the DewesoftX® features and settings, it is important to know the basics and the definition of the terms that are used in this discussion: so the following glossary should give us a solid foundation for the advanced topics that will follow.

When we talk about synchronisation in this chapter, we always mean inter-device-synchronisation between different measurement devices: e.g. between 2 SIRIUS® systems or between SIRIUS® and DEWE-43 or a DS-NET system, etc. Also the data from different channels and modules inside one measurement system are subject to synchronisation. This intra-device-synchronisation is usually very accurate and thus negligible.

8.2.1. Synchronisation glossary

8.2.1.1. Sampling

The analog signals that we want to measure are continuous time signals. Since all computer based systems are digital, we need to convert those continuous time signals to discrete time signals: this process is called sampling. A sample refers to a value at a point in time. Image below "Continuous signal" shows the continuous analog signal.
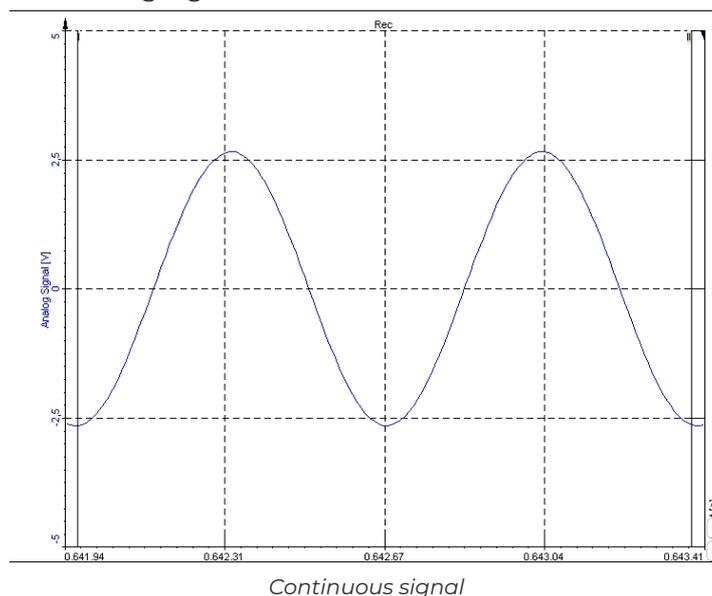
Continuous signal

Image below "Sampled (discrete) signal" shows the sampled version of the signal above "Continuous signal". The actual data consists only of the sampled points that you see as red dots in the diagram. The lines in between the points are just interpolated.
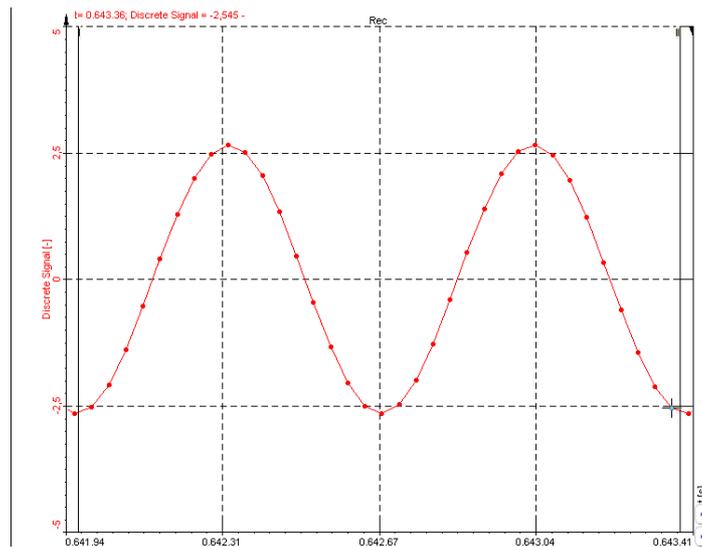
Sampled (discrete) signal

Image below "Slower sampled (discrete) signal" shows another sampled version of the signal in image "Continuous signal". But in comparison to image "Sampled (discrete) signal" we used a lower sample rate in this case. Because of the lower sample rate, we have fewer data points acquired and thus the interpolated signal does not resemble the original signal as good as "Sampled (discrete) signal" does.
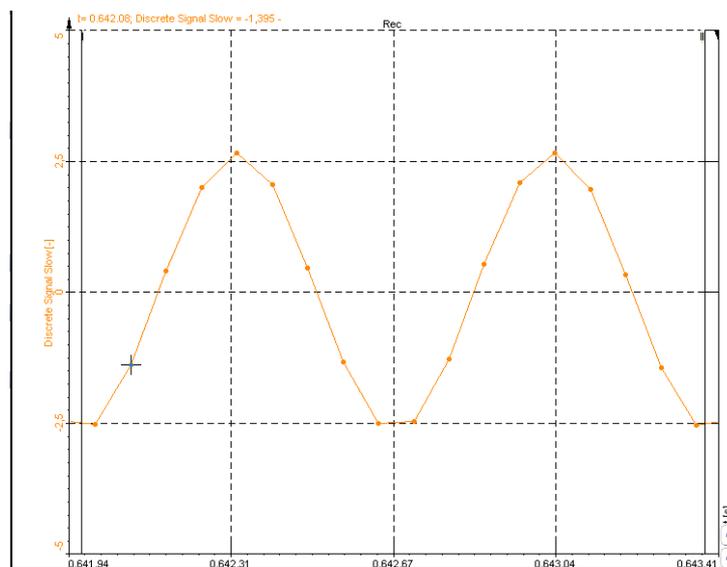
Slower sampled (discrete) signal

The sampling rate (aka. sample rate, sampling frequency) defines the number of samples per second taken from the continuous signal to create the discrete signal. The unit for the sampling rate is hertz (Hz) . The inverse of the sampling frequency is the sampling period or sampling interval, which is the time between samples.

8.2.1.2. Clock

A clock signal is a particular type of signal that oscillates between a high and a low state and is utilized like a metronome to coordinate actions.

Hint

Each SIRIUS® chassis has an internal clock. The sampling of the data-points is always correlated to this clock – so that the data-points of all channels (on all modules) refer to the same point in time.

Important

Please see chapter "General Specification" and "Time base accuracy" specification in the corresponding table!

8.2.1.3. Masterclock

Masterclock is a DewesoftX® term that refers to the main clock that is used to synchronise data and actions inside the DewesoftX® software.

Clockmaster is another DewesoftX® term that refers to the hardware device that provides the masterclock to DewesoftX®.

There are several possible source for the masterclock:
- whenever you have activated an analog device (e.g. SIRIUS®, DEWE-43) in DewesoftX® it will be used as clockmaster
- when you have no hardware devices activated at all, then the computer's clock will be used
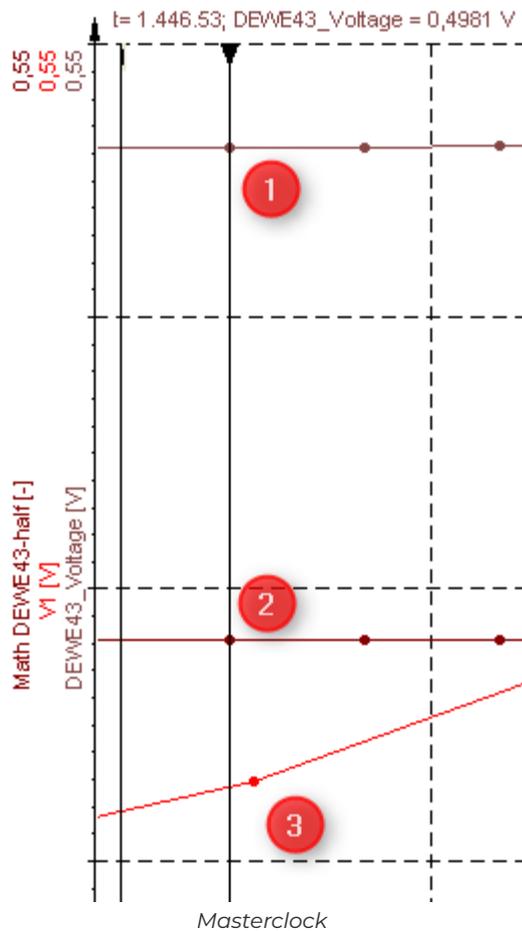
Masterclock

In the example in image above "Masterclock" we have used one channel called DEWE-43_Voltage ❶ (from a DEWE-43 of course), one mathematical channel called Math DEWE43-half ❷ (which just divides the value of the DEWE-43_Voltage channel by 2) and one channel of a DS-NET called V1 ❸.

Since DEWE-43 is an analog device (just like SIRIUS®), it will be the clockmaster. The mathematical channel will be synchronised with the masterclock: thus the points are perfectly aligned.

The channels of the DS-NET system are of course asynchronous in this case, thus the data point is not aligned to the synchronous channels.

8.2.1.4. Sampling jitter

The sampling frequency is normally assumed to be constant.

Samples should be converted at regular intervals. In real-world applications this can not be achieved. The error introduced is called sampling jitter, which describes the time variation of the real clock in relation to the ideal clock.

8.2.1.5. Sync / Async channels

In DewesoftX® there are 2 fundamentally different types of channels: synchronous (e.g. analog data) and asynchronous (e.g. CAN data) channels.

Synchronous channels always have exactly one data point related to the masterclock and the time between 2 adjacent data points is always constant.
In the example below you can see 3 synchronous channels and that the data points of all the channels are perfectly aligned to each other.

Synchronous channels
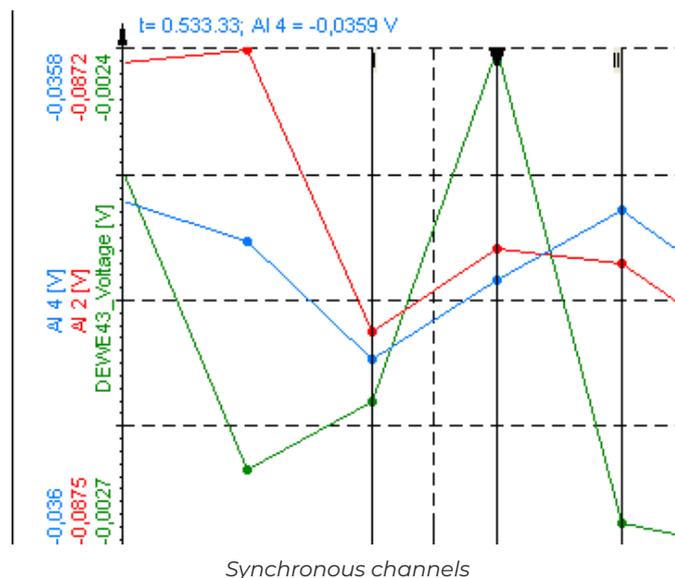
Asynchronous channels may have data points at any instant of time and the time between 2 adjacent data points may vary.

In the example below you see the green signal which is a synchronous channel of a SIRIUS® (which is clock master) and 3 channels from 3 different DS-NET systems which are of course asynchronous. When you take a look at the black line denoted with ❶ in image below "Asynchronous channels" you can see that the asynchronous data points are not aligned to the green synchronous data points and also not aligned to each other.

Asynchronous channels
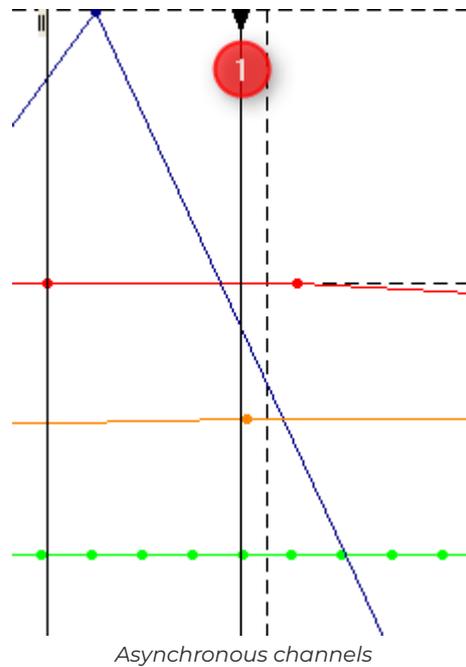
Sync channels are much easier to handle because of the fact that the time between all their data points is equal. This also makes some computations much easier (which means that CPU power is much lower). E.g. displaying sync channels in a recorder is easy, but displaying asynchronous channels in a recorder requires many more calculations and thus much more CPU power (because we need to calculate the right horizontal position for each data point).

Some functions in DewesoftX® only work with synchronous channels: e.g. in the channel list of the FFT or scope widget screen only sync channels will show up – async channels cannot be used.
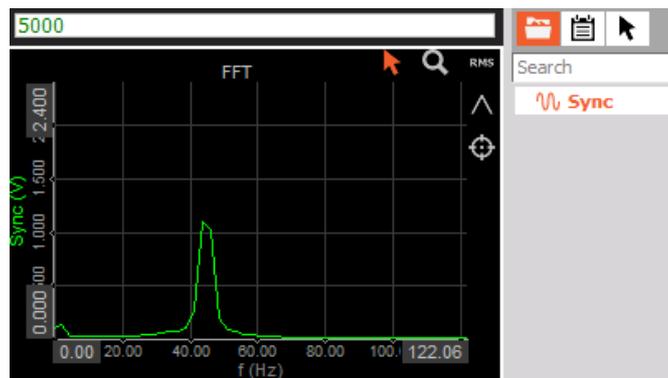
FFT screen: only sync channels

In the recorder screen you can also use async channels. The image below "Recorder screen: also async channels" shows the Recorder screen with the same channel setup as in image above "FFT screen: only sync channels".
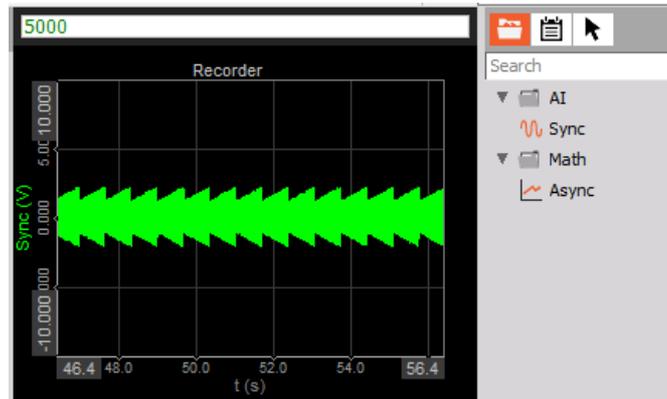
Recorder screen: also async channels

8.2.2. Sync options

When you have several measurement systems, each of those systems has its own internal clock (e.g. 2 SIRIUS® systems). Since no real-world hardware is perfect the 2 clocks will run at slightly different speeds and thus will drift more and more apart from each other.

8.2.2.1. Hardware synchronisation

The best way to synchronise the clocks of several devices is to use some sort of hardware synchronisation that transmits a signal that can be used by the devices to synchronise their clocks to each other.

Example

Depending on your SIRIUS® enclosure version you have these options:
- SIRIUS® USB slices: Connect the slices via sync cables. See: "Connection example - Two SIRIUS USB/EtherCAT devices - USB"
- SIRIUS® EtherCAT®: slices: You do not need additional cables, because devices are synchronised by EtherCAT® distributed clock mechanism.
- SIRIUS® Boxed Solution and Rack versions: You do not need additional sync cables, because the synchronisation is wired internally.

Hint

- You can synchronise SIRIUS® systems to each other or also to other devices (e.g. DEWE-43, DS-NET)
- Note that the hardware synchronisation function is not related in any way to the setting of the clockmaster

8.2.2.2. One PC and 2 SIRIUS® USB devices

In this case you must connect your SIRIUS® chassis systems with special synchronisation cables (see image below "HW-sync cable"). The cables have 4-pin LEMO connectors which fit into the SYNC connectors on the back side of the SIRIUS® chassis (see chapter "SINGLE SLICE USB").

HW-sync cable

These cables can be ordered as options to your SIRIUS® system under the following designations: SYNC-CBL-05M (0.5m length), SYNC-CBL-3M (3m length)

8.2.2.3. Several PCs and SIRIUS® devices

The NET option allows combining the data of multiple DewesoftX® instances, running on different PCs (orSBOXes) in one measurement. This is useful if you have a locally distributed measurement task, or if you need more processing power, than a single CPU can provide. The data-transfer between the different PCs is done over Ethernet: so all the PCs must be connected to the same LAN. Moreover we need to connect all involved SIRIUS® slices with a sync-cable. One of the PCs will be the Master, which can start/stop the measurement on all PCs and this Master will also be configured to provide the synchronisation signal to the Slave units.

8.2.2.4. Master / Slave NET option setup

In the settings dialogue of the Master unit, click ❶ and then add the **Dewesoft NET** option (click the plus button at the right side of the Measurement unit line. Then select your slave unit/s. The slave unit/s will now show up in the device list ❷. We need to configure the Synchronization settings of the master, so that it will generate the IRIG signal which will be transferred via the sync-cable to the slave measurement units: as Time source select Dewesoft DAQ Devices ❸ and as Clock provider select IRIG-B DC ❹.
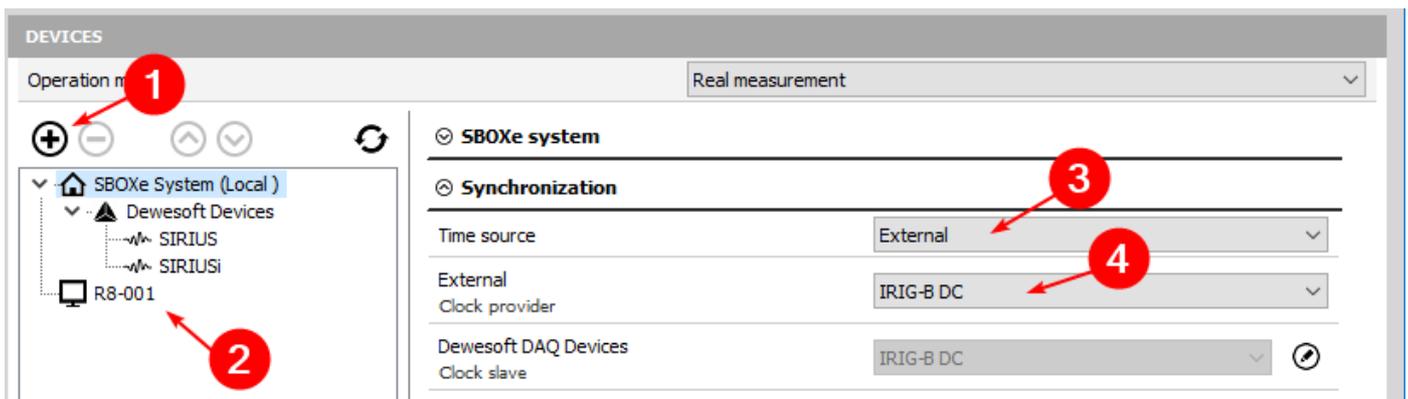
NET Option Master Setup

We must configure the slave measurement unit/s to receive the synchronisation signal from the Master. In the Settings dialogue, activate the Dewesoft NET option ❶. Then set the Time source to External ❷ and the Clock provider to IRIG-B DC ❸.

NET Option Slave Setup

8.2.2.5. Software synchronisation

When the data that we get from asynchronous devices includes also a time-stamp, DewesoftX® can do a so called software synchronisation. In this case, the channels will still be asynchronous and will have a time delay relative to other synchronous channels, but at least the time-drift will stay almost constant. The DS-NET plug-in will always use soft sync for asynchronous channels. Image below "*Soft sync*" shows 3 channels of 3 different DS-NET systems. DSNET1 and DSNET2 are connected via hardware sync cables (DSNET3 is not). We do not use any analog device. You can see that the channels of the synchronised systems DSNET1_Voltage, DSNET2_Voltage are perfectly aligned to each other and the the asynchronous channel DSNET3_Voltage of the 3rd (not hardware-synchronised) system is delayed by some milliseconds (which is often acceptable when you are measuring slow signals). Even if you leave that measurement running for days and weeks, the time drift will stay almost constant.

Soft sync
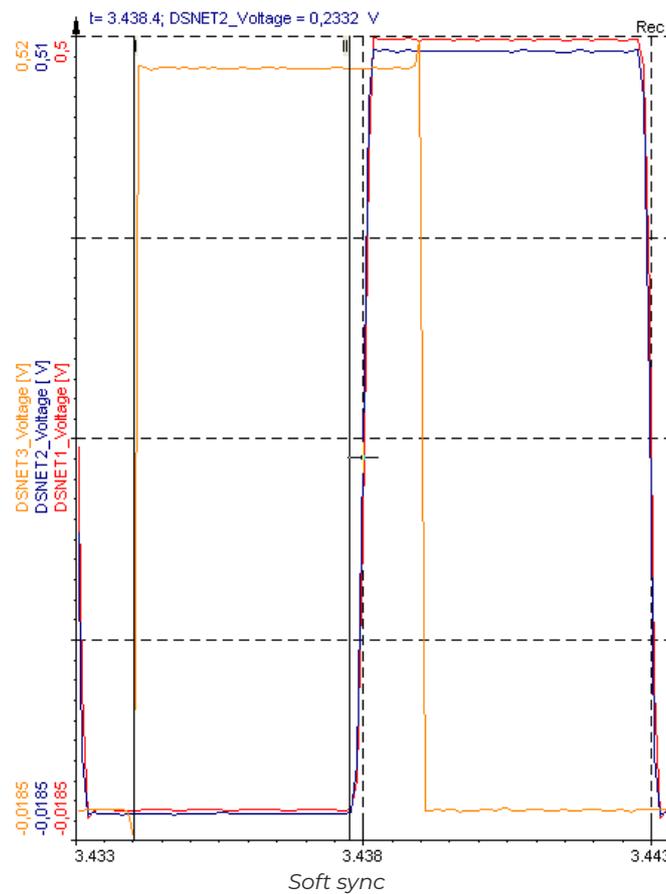
8.2.2.6. No synchronisation

If you use no synchronisation at all the time shift between the signals of the 2 devices will become bigger and bigger the longer the measurement takes. At the beginning of the measurement the signals will be very good aligned. In image below "*No sync: start of measurement*" you can only see one of the signals, signals are completely overlapped.
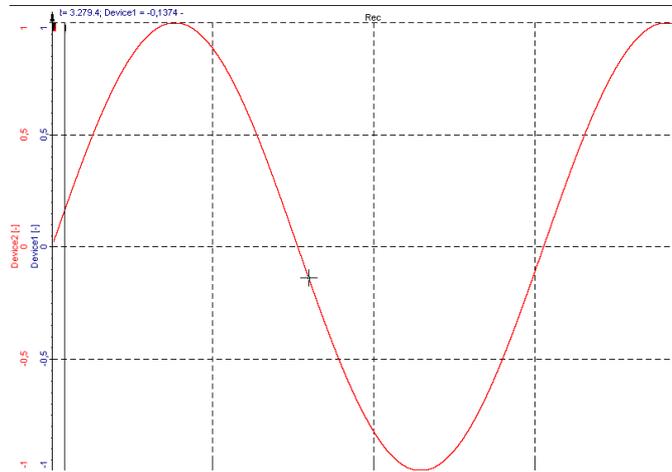
No sync: start of measurement

After some time (depending on the relative clock drift of the 2 devices), you will see that the signals are not perfectly aligned any more...
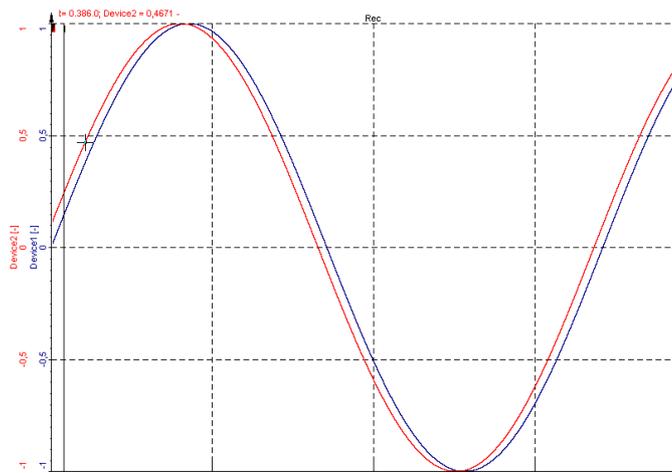
No sync: small offset

...and the longer the measurement takes, the worse the offset will become.

No sync: big offset
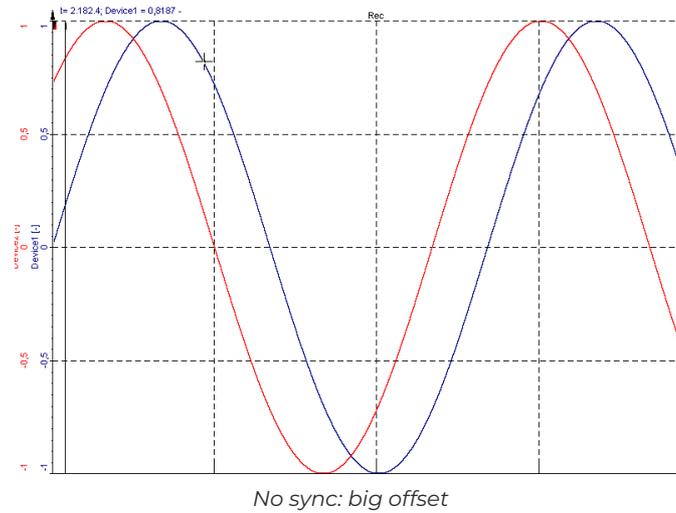
8.3. Strain amplifiers

8.3.1. Lead wire compensation

We invite you to find the explanation of the lead wire compensation in our Online PRO Training for Strain measurement in the 18th chapter: Lead wire effect.

8.3.2. Shunt options

	STGMv3(w, w+) STGMv2	STGv2, STGv3, STGv4 UNI HS-STG	HD-STGS(w)	MULTI STGM
Full	Yes	Yes	Yes	Yes
Half	Yes	Yes	Yes	Yes
Quarter 4-wire	No	Yes	No	No
Quarter 3-wire	120 Ohm, 350 Ohm	120 Ohm, 350 Ohm	Yes	120 Ohm, 350 Ohm
Quarter CC	No	120 R, 350 R Sns+ 59.88 kR Sns+ 175kR	No	No
Bridge shunt	Sns+ 100 kOhm to In+ Sns- 100 kOhm to In-	Sns+ 59.88 kOhm to In+ Sns- 59.88 kOhm to In- Sns+ 175 kOhm to In+ Sns- 175 kOhm to In-	Sns+ 100 kOhm to In+ Sns+ 100 kOhm to In-	Sns+ 100 kOhm to In+
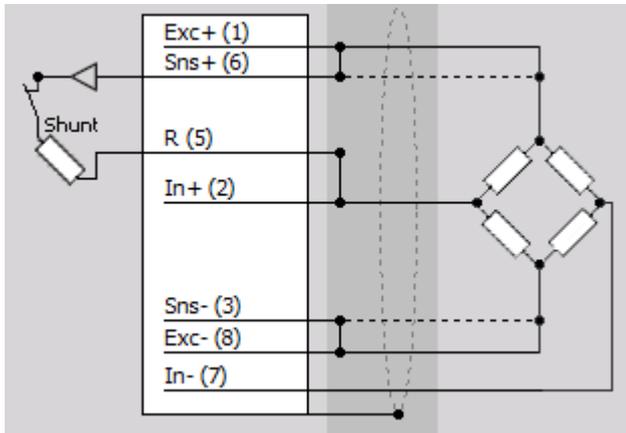
Sns+ to In+
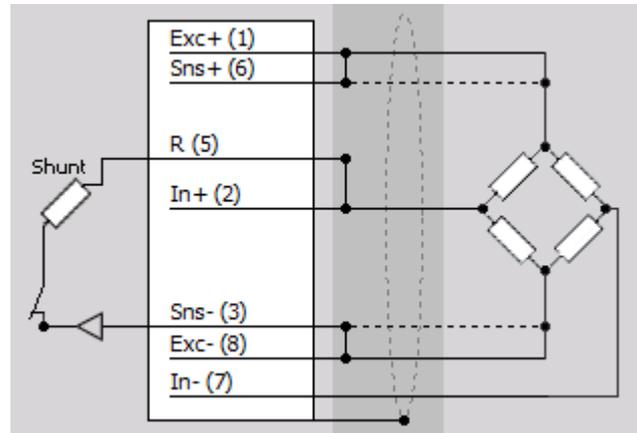
Sns- to In+
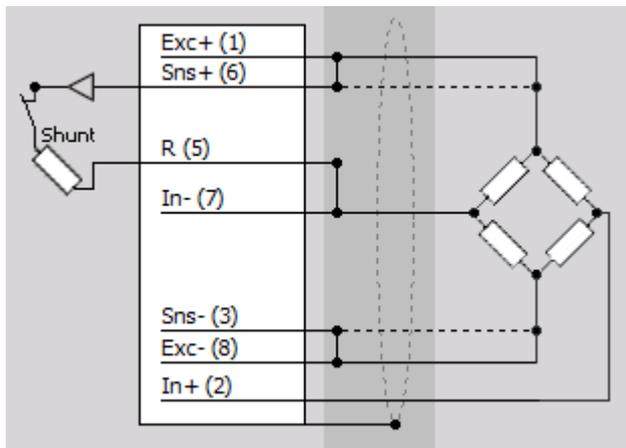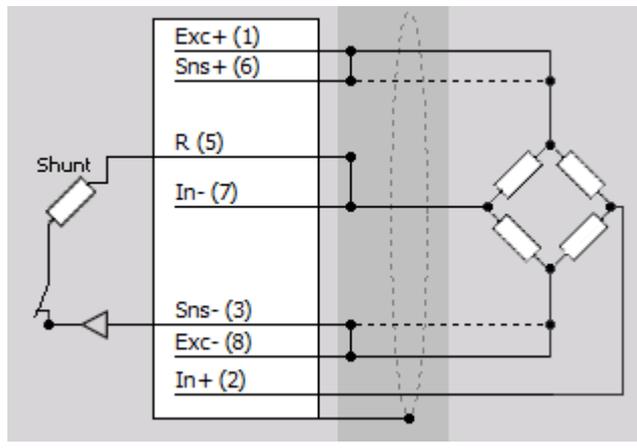
Sns+ to In+

Sns- to In+
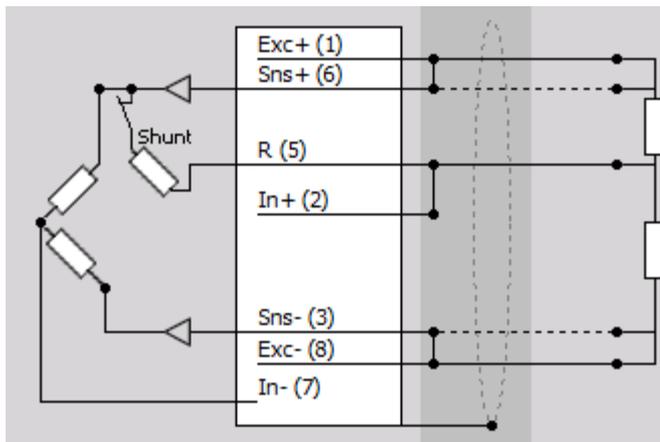
Half bridge
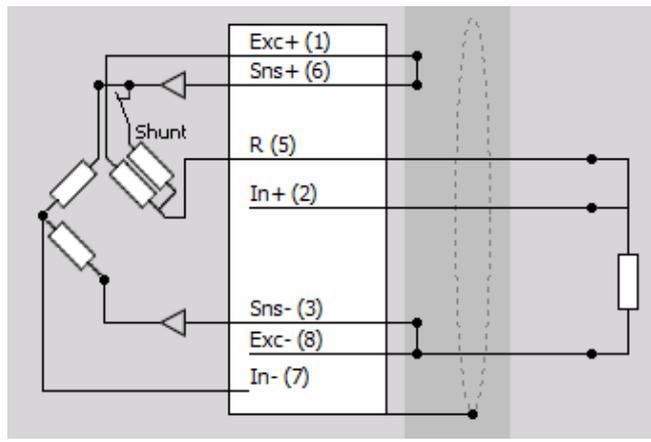
Quarter 3-wire
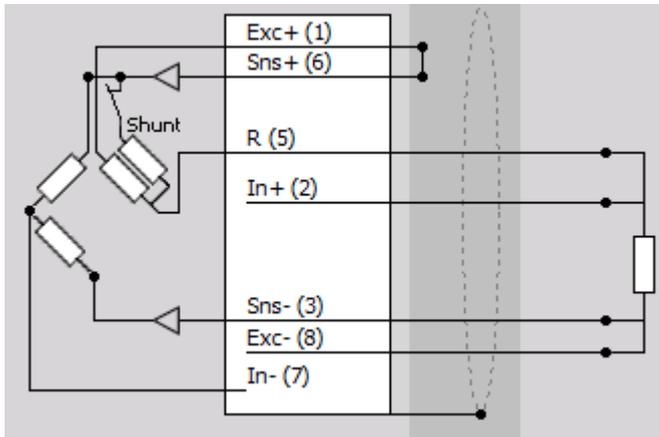
Quarter 4-wire
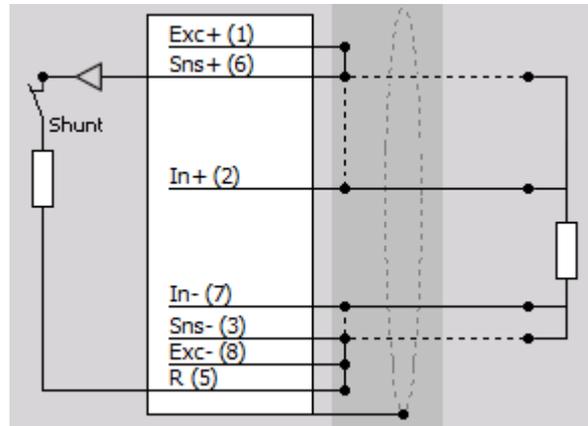
Quarter CC

8.3.3. Single ended / Differential Input type connection

	STGMv3(w, w+)	STGv2 STGv3 STGv4 UNI HS-STG	HD-STGS(w)	MULTI STGM STGMv2
Internal electronic switch	Yes	Yes	No	No
External required	No	No	Yes	Yes
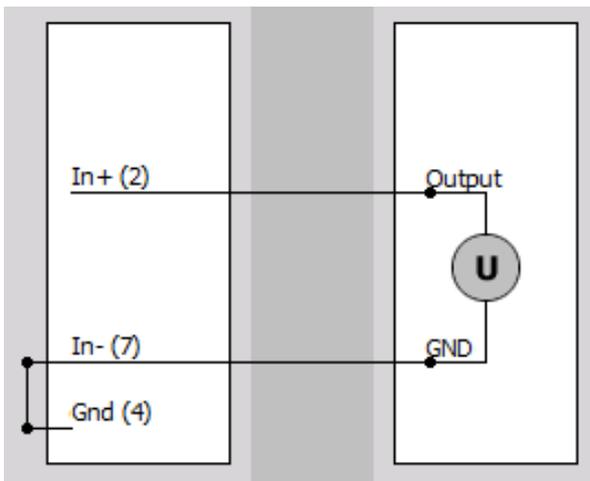
Single ended Input type,
Internal electronic switch
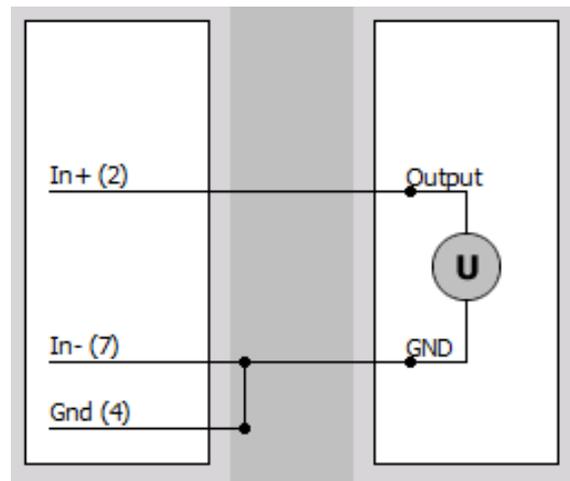
Single ended Input type,
External connection required

9. Warranty information

Notice
The information contained in this document is subject to change without notice.

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The copy of the specific warranty terms applicable to your Dewesoft product and replacement parts can be obtained from your local sales and service office. To find a local dealer for your country, please visit https://dewesoft.com/support/distributors.

9.1. Calibration

Every instrument needs to be calibrated at regular intervals. The standard norm across nearly every industry is annual calibration. Before your Dewesoft data acquisition system is delivered, it is calibrated. Detailed calibration reports for your Dewesoft system can be requested. We retain them for at least one year, after system delivery.

9.2. Support

Dewesoft has a team of people ready to assist you if you have any questions or any technical difficulties regarding the system. For any support please contact your local distributor first or Dewesoft directly.

Dewesoft d.o.o.
Gabrsko 11a
1420 Trbovlje Slovenia

Europe Tel.: +386 356 25 300
Web: http://www.dewesoft.com
The telephone hotline is available Monday to Friday from 07:00 to 16:00 CET (GMT +1:00)

9.3. Service/repair

The team of Dewesoft also performs any kind of repairs to your system to assure safe and proper operation in the future. For information regarding service and repairs please contact your local distributor first or Dewesoft directly on https://dewesoft.com/support/rma-service.

9.4. Restricted rights

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9.6. Trademarks

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10. Safety instructions

Your safety is our primary concern! Please be safe!

10.1. Safety symbols in the manual

! Warning

Calls attention to a procedure, practice, or condition that could cause body injury or death

Caution

Calls attention to a procedure, practice, or condition that could possibly cause damage to equipment or permanent loss of data.

10.2. General Safety Instructions

! Warning

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. Dewesoft d.o.o. assumes no liability for the customer's failure to comply with these requirements.

All accessories shown in this document are available as an option and will not be shipped as standard parts.

10.2.1. Environmental considerations

Information about the environmental impact of the product.

10.2.2. Product End-of-Life handling

Observe the following guidelines when recycling a Dewesoft system:

10.2.3. System and components recycling

Production of these components required the extraction and use of natural resources. The substances contained in the system could be harmful to your health and to the environment if the system is improperly handled at its end of life! Please recycle this product in an appropriate way to avoid unnecessary pollution of the environment and to keep natural resources.

This symbol indicates that this system complies with the European Union's requirements according to Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). Please find further information about recycling on the Dewesoft web site www.dewesoft.com

Restriction of Hazardous Substances
This product has been classified as Monitoring and Control equipment and is outside the scope of the 2002/95/EC RoHS Directive. However, we take care of our environment and the product is lead-free.

10.2.4. General safety and hazard warnings for all Dewesoft systems

The safety of the operator and the unit depend on following these rules.
- Use this system under the terms of the specifications only to avoid any possible danger.
- Read your manual before operating the system.
- Observe local laws when using the instrument.
- DO NOT touch internal wiring!
- DO NOT use any higher supply voltage than specified!
- Use only original plugs and cables for harnessing.
- You may not connect higher voltages than rated to any connectors.
- The power cable and connector serve as Power-Breaker. The cable must not exceed 3 meters, the disconnect function must be possible without tools.
- Maintenance must be executed by qualified staff only.
- During the use of the system, it might be possible to access other parts of a more comprehensive system. Please read and follow the safety instructions provided in the manuals of all other components regarding warning and security advice for using the system.
- With this product, only use the power cable delivered or defined for the host country.
- DO NOT connect or disconnect sensors, probes or test leads, as these parts are connected to a voltage supply unit.
- Ground the equipment: For Safety Class 1 equipment (equipment having a protective earth terminal), a non-interruptible safety earth ground must be provided from the mains power source to the product input wiring terminals.
- Please note the characteristics and indicators of the system to avoid fire or electric shocks. Before connecting the system, please read the corresponding specifications in the product manual carefully.
- The inputs must not, unless otherwise noted (CATx identification), be connected to the main circuit of category II, III and IV.
- The power cord separates the system from the power supply. Do not block the power cord, since it has to be accessible for the users.
- DO NOT use the system if equipment covers or shields are removed.
- If you assume the system is damaged, get it examined by authorized personnel only.

- Adverse environmental conditions are Moisture or high humidity Dust, flammable gases, fumes or dissolver Thunderstorm or thunderstorm conditions (except assembly PNA) Electrostatic fields, etc.
- The measurement category can be adjusted depending on the module configuration.
- Any other use than described above may damage your system and is attended with dangers like short-circuiting, fire or electric shocks.
- The whole system must not be changed, rebuilt or opened.
- DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until the safe operation can be verified by service-trained personnel. If necessary, return the product to the Dewesoft sales and service office for service and repair to ensure that safety features are maintained.
- If you assume a more riskless use is not provided anymore, the system has to be rendered inoperative and should be protected against inadvertent operation. It is assumed that a more riskless operation is not possible anymore if the system is damaged obviously or causes strange noises. the system does not work anymore. the system has been exposed to long storage in adverse environments. the system has been exposed to heavy shipment strain.
- Warranty void if damages caused by disregarding this manual. For consequential damages, NO liability will be assumed!
- Warranty void if damage to property or persons caused by improper use or disregarding the safety instructions.
- Unauthorized changing or rebuilding the system is prohibited due to safety and permission reasons (CE).
- Be careful with voltages >25 VAC or >35 VDC! These voltages are already high enough in order to get a perilous electric shock by touching the wiring.
- The product heats during operation. Make sure there is adequate ventilation. Ventilation slots must not be covered!
- Only fuses of the specified type and nominal current may be used. The use of patched fuses is prohibited.
- Prevent using metal bare wires! Risk of short circuit and fire hazard!
- DO NOT use the system before, during or shortly after a thunderstorm (risk of lightning and high energy over-voltage). An advanced range of applications under certain conditions is allowed with therefore designed products only. For details please refer to the specifications.
- Make sure that your hands, shoes, clothes, the floor, the system or measuring leads, integrated circuits and so on, are dry.
- DO NOT use the system in rooms with flammable gases, fumes or dust or in adverse environmental conditions.
- Avoid operation in the immediate vicinity of high magnetic or electromagnetic fields, transmitting antennas or high-frequency generators, for exact values please refer to enclosed specifications.
- Use measurement leads or measurement accessories aligned with the specification of the system only. Fire hazard in case of overload!
- Lithium ion batteries are classified as not hazardous when used according to the recommendations of the manufacturer described in Battery Safety Data Sheet, which is available for download from our homepage: http://www.dewesoft.com/download.
- Do not switch on the system after transporting it from a cold into a warm room and vice versa. The thereby created condensation may damage your system. Acclimatize the system unpowered to room temperature.

- Do not disassemble the system! There is a high risk of getting a perilous electric shock. Capacitors still might be charged, even if the system has been removed from the power supply.
- The electrical installations and equipment in industrial facilities must be observed by the security regulations and insurance institutions.
- The use of the measuring system in schools and other training facilities must be observed by skilled personnel.
- The measuring systems are not designed for use in humans and animals.
- Please contact a professional if you have doubts about the method of operation, safety or the connection of the system.
- Please be careful with the product. Shocks, hits and dropping it from already- lower level may damage your system.
- Please also consider the detailed technical reference manual as well as the security advice of the connected systems.
- This product has left the factory in safety-related flawlessness and in proper condition. In order to maintain this condition and guarantee safety use, the user has to consider the security advice and warnings in this manual.

EN 61326-3-1:2008
IEC 61326-1 applies to this part of IEC 61326 but is limited to systems and equipment for industrial applications intended to perform safety functions as defined in IEC 61508 with SIL 1-3.

The electromagnetic environments encompassed by this product family standard are industrial, both indoor and outdoor, as described for industrial locations in IEC 61000-6-2 or defined in 3.7 of IEC 61326-1.

Equipment and systems intended for use in other electromagnetic environments, for example, in the process industry or in environments with potentially explosive atmospheres, are excluded from the scope of this product family standard, IEC 61326-3-1.

Devices and systems according to IEC 61508 or IEC 61511 which are considered as "operationally well-tried", are excluded from the scope of IEC 61326-3-1.

Fire-alarm and safety-alarm systems, intended for the protection of buildings, are excluded from the scope of IEC 61326-3-1.

11. Documentation version history

Version	Date [dd.mm.yyyy]	Notes
V20-1	01.07.2020	• The NEW SIRIUS manual - Reworked and revised version
V20-2	19.10.2020	• HS filtering description updated • Corrected pin-out on Multi module
V21-1	26.01.2021	• Modes added and Input termination, impedance updated in General Counter specifications
V21-2	26.02.2021	• Updated section 11.2.4. General safety and hazard warnings for all Dewesoft systems • Removed Sirius LV 20V range in SIRIUS dual core specifications table • 4.8.4. Added scope of supply for R2DB
V22-1	25.01.2022	• Updated naming for R8D and R8DB ○ Front side was renamed to Amplifier side ○ Rear side was renamed to Display side • 4.3.2. Added a description of the Krypton side holder • 5.3.3. Added pictures of other SIRIUSiwe devices • 5.7.3. Included information on Low-pass filters on Sirius HS • 6.1.3.3 Bandwidth vs. Aliasing-free bandwidth - updated picture • Added products: ○ SIRIUSi 8xMIC200 ○ SIRIUSi 8xUNI
V22-2	18.07.2022	• 5.5. Sirius HS-ACC fixed the minimum voltage range • 5.6. SIRIUSwe updated information about internal shunt resistor • 4.4.2.1. SBOX GPS updated pinouts for 10Hz and 100Hz GPS • 4.4.3. Added VGPS-DISP pinout • 5.4. General specifications: added Power consumption for UNI and MIC200 amplifiers • 5.25 Analog Out: Correction for Signal conditioning option for HD series
V22-3	16.12.2022	• 5.22.1. HS-HVv2: Specifications changed Gain Drift and Offset Drift • 5.22.2. HS-HVv3: Specifications added specs of an upgraded version of HS-HV • 4.5.1. SIRIUS-SBOXe/fe: Specifications added specs for SBOXe v2, the upgraded version • 4.11.1. SIRIUS-SBOXre ○ changed description to match new specifications, ○ Added specifications table for SBOXre v1 and SBOXre v2 • 4.11.2. SIRIUS-R8: Specifications changed table of specifications according to the version of SBOXre

V23-1	03.04.2023	5.26. CAN: new chapter - Added or updated specifications for multiple amplifiers and systems including: - Enclosure overview - Charging power on some systems - Derating information - Overvoltage protection information - Bridge mode accuracy and additional information for all strain amplifiers - SBOX RAM capabilities - Display information 5.25 Analog Out: added note on switching slices with AO on R2/R4/R8 Systems 8.3. Strain amplifiers: new chapter - Excluded Appendix chapter - Changed renders for R1 / R2 systems 6.1.5.1. Analog filter: additional information on SW LP filters - Updated descriptions of connections for STG and LV amplifiers

11.1. Previous versions history

Version	Date [dd.mm.yyyy]	Notes
1.3.0	13.11.2014	- New orange logo and style - non-isolated is now called differential - Added CHG, LV, HD-ACC, HS-CHG, HS-HV, HS-LV, HS-STG - Replaced STGM with STGMv2, HV with HVv2 and STG with STGv2 - Added SIRIUS-R2D, SIRIUS-R8D, updated SIRIUS-R8 - Corrected specs - HS-ACC (sampling rate) - MULTI: Bridge Ranges - HD-LV: ADC type, Over-voltage Protection - HD-STGS: ADC type, Bridge Ranges, Exc. Voltage, removed Counters - Analogue-out: bandwidth - Expanded general specifications - SBOXx-GPS: removed 1Hz: all others are optional - Added power connector pins and mating connectors
1.3.1	23.01.2015	- Added HD-ACC module - Added HD-LV BNC - Updated Specs: LV2 , Multi, STGv2, STGMv2, HS-ACC, HS-CHG, HS-STG
1.4.0	18.04.2015	Added EtherCAT® information

1.4.1	01.10.2015	- Updated image of EtherCAT single slice version in chapter 4.2.2: now you see the USB connector - Updated pin-out images of BNC connectors - SIRIUS® is now a registered trademark - Added chapter 6 Measurement including Anti-Aliasing - Added chapter for Firmware-upgrade - ACC+: corrected Sensor Supply voltage (was 14V – now 12V) - Digital Filter (vs. Sample Rate): removed from Specifications tables and moved to "ADC oversampling chapter" and corrected the frequency ranges - MSI-BR-TH are now called MSI-TH - Chapter "HS-LV DSUB-9": corrected connectors and wiring diagrams - CHG and HS-CHG: added missing Input coupling 0.5Hz - Added chapter for "R8D Mounting"
1.4.2	13.11.2015	- General Specifications: Updated Humidity, added Acquisition rate – Time base accuracy - HVv2, HS-HV: updated Input Impedance - Corrected description of Illustration in 5.21.2 HS-STG+ (Counter) L1B7f
1.4.3	02.03.2016	- The Accessories chapter has been moved to a separate document (Accessories & Sensors) - Corrected article number of sync mating connector
1.4.4	09.03.2016	- Replaced R2D with R2DB - Corrected the Power connector types - Corrected image of SBOXf backside-connectors - Removed 20Hz GPS option - Removed old documentation history entries (pre 1.3.0) from this table
1.5.0	09.03.2017	- Added R8DB, R2D, SBOXre - changes: SBOX2→SBOXe, FLASH120→FLASH250, SIRIUSf-SBOX→SBOXfe, Single slice→Modular solution, Mulit-slice→Boxed Solution - Updated specifications of all SBOXes - Updated specifications to HS-LVv2 and HS_HVv2, HD-STGS (dynamic Range) - Counter modules: - added chapter "General Counter Specifications" and clarification of the GND connection - updated images - Added "R2DB Power-Out Specifications", pinning table for 5.13.5 STG DSUB-9, description for "Module" in chapter 5.2 Technology overview, - table with GPS specifications, MIL-STD-810D to Specifications, chapter "HS-STG: Sensor connection" - Added Mating Connector info to STG-L2B7f, STG-L2B10f and HD-STGS L1B10f

		• Update STGM to STGMv3 (Excitation Voltage: Predefined levels) • Updated STGv2 to STGv3: ○ Updated Typ. CMR ○ Max. common mode voltage • Updated ACC to ACCv2 (IEPE mode Excitation) ○ Updated: Offset drift, Channel cross talk, Input coupling, Input Impedance • Updated HS-LV Input Impedance • HD-LV: added max. common mode voltage • HD-STGS: Max. common mode voltage • Corrected ADC link in specs of: HS-HV, HS-LV, HS-STG • HS-STG: update: offset drift, Max. common mode voltage, Offset accuracy after Balance Amplifier, Input accuracy • Table 7: R2DB Battery Specifications: improved "Power Out" section • Major changes to chapter "4 Enclosure Overview" • Updated chapter 3 to newer DewesoftX® version and to Windows® 10 • Updated chapter 8.2.2.2 Several PCs and SIRIUS® systems related to the NET option • Updated chapter 5.22 Analogue out OPTION
1.5.1	22.09.2017	• "5.11.3.4 MULTI-L2B16f", "5.12.6.4 STGM-L2B16f": corrected pins for Exc+ and Exc- • The numbers in the page-footer now in the document the numbers in the PDF • SBOXe and SBOXfe USB rear ports • Added Flyback diode at all open collector digital output schematics for relays • HS-STG Analog input accuracy update
1.5.2	12.10.2017	• Added common mode voltage specs for isolated versions • Added voltage warnings
1.5.3	19.12.2017	• Added front USB connector info for R2DB i7 version
1.5.4	27.02.2019	• Update general power supply in chapter 5.6 from 6-36V to 9-36V
1.5.5	09.08.2019	• ACCv2: Update of Dynamic Range Specifications @ 50kHz • STGMv3: Update of Channel Cross talk specifications @ 1kHz
		--- THE END ---